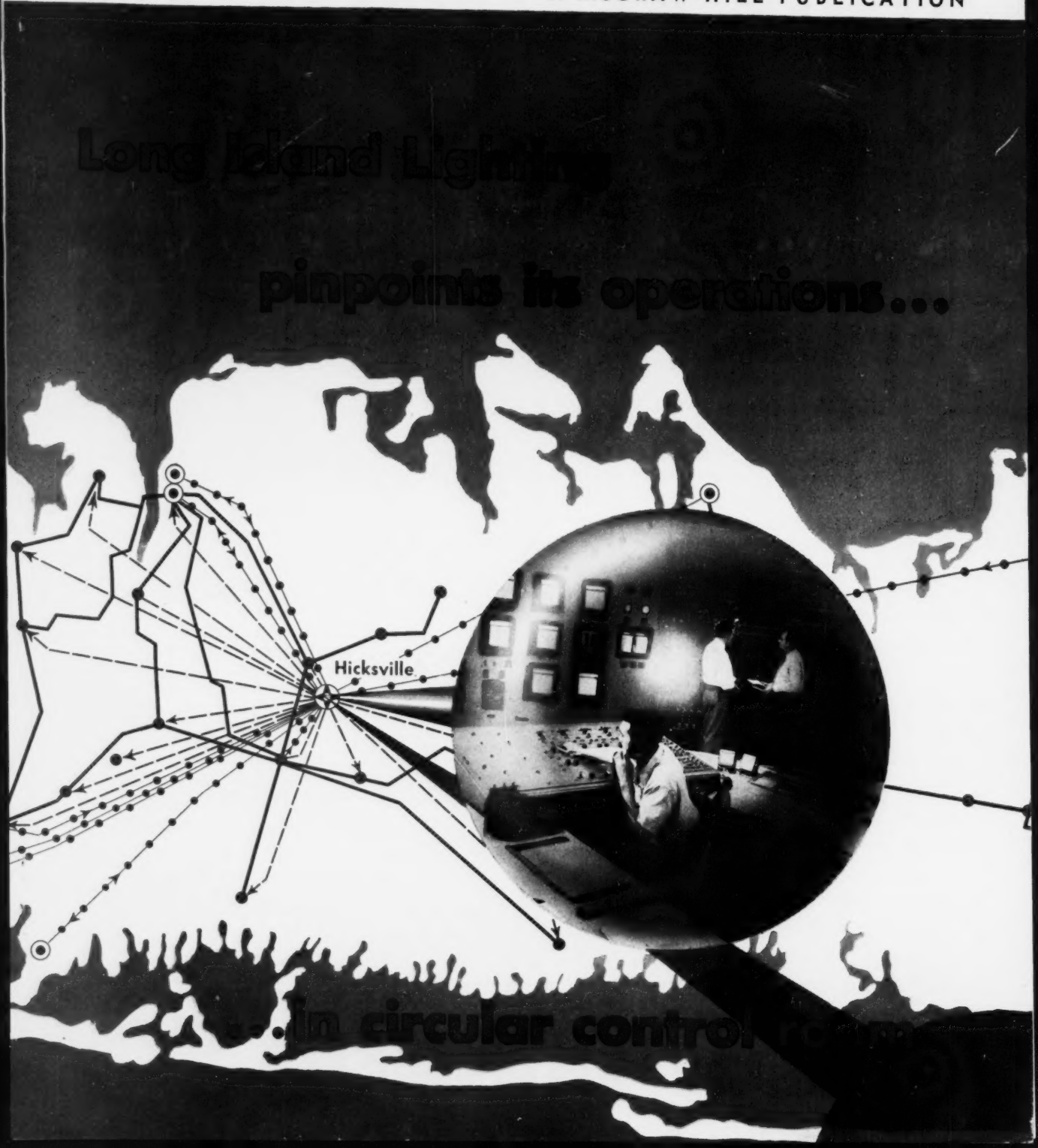
NOVEMBER 30, 1953

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION



Long Island Lighting Co.

pinpoints its operations...

...in circular control rooms

Increase SYSTEM Revenue

ALLIS-CHALMERS

5/8% STEP VOLTAGE REGULATORS

MECHANISM both field and laboratory tested . . . will withstand five million operations.

CONTACTS designed for long life, made of arc-resisting materials of generous size.

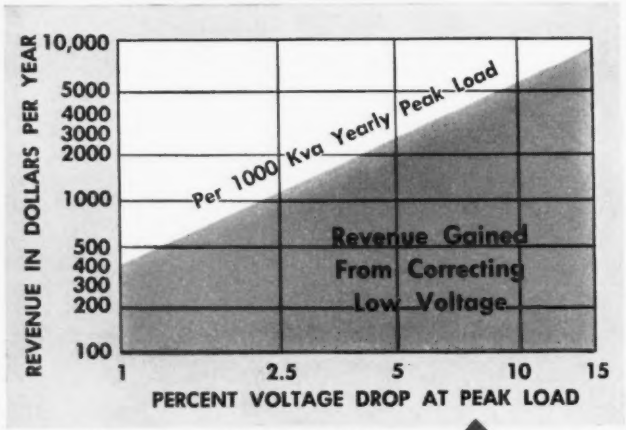
UNIT CONSTRUCTION assures top quality workmanship — all connections made before tanking.

MAINTENANCE is simplified. Control, for example, is easy to adjust, simple to remove and replace.

You can improve the profit picture on almost any feeder with Allis-Chalmers distribution regulators. The chart at right shows how controlled voltage can increase revenue. The cost is low. Most users find they pay back their cost in less than two years.

Installation is easy. Mount your A-C distribution regulators on a pole near the load or put them on simple foundations right next to substation transformers.

It will pay you to get the complete facts. Call your nearby A-C district office or write Allis-Chalmers, Milwaukee 1, Wis.



Assuming: 90% Power Factor; 40% Load Factor; 50% Lighting Load; Energy Charge: 3¢/kwhr; Average Lighting Load Drop — 70% of Peak Load Drop; You can interpolate directly for other loads.

A-4183

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

MEET THIS WEEK'S WRITERS

J. L. Davidson and J. R. Gummersall, who describe Long Island Lighting Co's underground control center on page 78, are used to working as a team. Their cooperative efforts have been extended to the classroom,, where they taught courses in Symmetrical Components for two years to 70 employees in the company's engineering education program.

Davidson, who since May has been electric planning engineer, joined the utility in 1942. He had previously spent 11 years with Consolidated Edison Co of N. Y. He is a holder of B.S. and E.E. degrees from Virginia Military Institute and an M.E.E. from Brooklyn Polytechnic Institute.

Jim lives in Port Washington, L. I. with his wife and three daughters, aged 13, 10, and 7. His hobbies include photography and listening to records on the hi-fidelity machine he has rigged up in the living room.

Gummersall, who has been system operating engineer for the past year, has been with Long Island Lighting since 1937—excepting wartime service with the Marine Corps. He has also served as a relay engineer and plant engineer since he joined the utility after receiving his B.E.E. from Cooper Union.

John lives in Oyster Bay, L. I. with his wife and boy, aged 2, and a girl, aged 4. He spends part of every vacation skiing with the missus in New Hampshire or Vermont, and sneaks in a bit of summertime sailboating now and again.

George S. Lunge, the man who wrote the single channel frequency control story on page 86, was born in London, England, in 1899. He arrived in this country, in 1913, later attending University of Washington and University of California. California conferred a B.S. on him in 1922 and he took it to GE, which took him on as a test engineer. There he's been ever since. Since 1927 he has served in the company's electric utility engineering section.

Lunge was a member of Eta Kappa Nu and an associate member of Sigma Xi.

For relaxation? He likes hiking and stamps.

Electrical World

Published for 79 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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case history

no oil migration

This series of Okolite-Okoprene equalizer bus ties is installed in the Cincinnati Gas and Electric Company's West End Station. One of the reasons for choosing this cable design for vertical runs is that it eliminates oil migration problems inherent in varnished cambric and paper-insulated constructions. This feature is just one reason why today's best buy in high voltage cables is Okolite-Okoprene.

WHY THEY'RE SWITCHING TO OKOLITE

rubber-insulated cables for use up to 35,000 volts

There is a distinct trend among industrials and public utilities toward Okolite rubber-insulated cables for high voltage use.

ADVANTAGES

1. **Lighter and easier handling.**
2. **Eliminates sheath corrosion and fatigue.**
3. **Simplifies splicing and terminating.**
4. **Moisture does not affect the insulation.**
5. **No oil migration at high temperatures or elevations.**
6. **Flexibility simplifies installation.**

APPLICATIONS

1. **Transmission and distribution circuits.**
2. **Generator and transformer leads.**
3. **Vertical risers and shaft cables.**
4. **Submarine power cables.**
5. **Portable substation cables and test leads.**
6. **X-ray cables.**

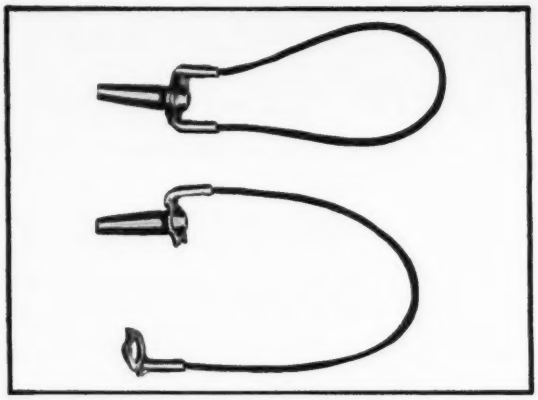
Send for this 128-page manual on rubber-insulated high voltage cable. It provides current carrying capacity tables, dimensional data, engineering information and installation procedures, complete instructions and detailed drawings for splices and terminations. Write for Bulletin EW-1075 on your letterhead to The Okonite Company, Passaic, New Jersey.

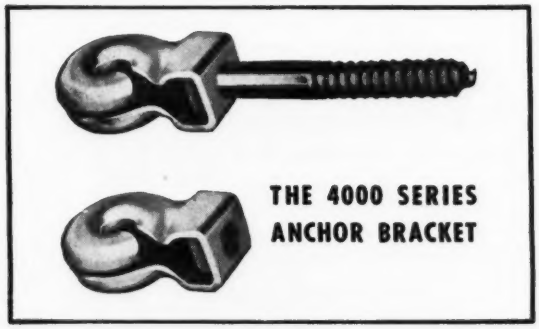
OKONITE SINCE 1878 *insulated cables*

1871

Electroline AUTOMATIC DEAD-END

for Neutral Supported Multiple Conductor Service-Drop Cable





THE 4000 SERIES ANCHOR BRACKET

This Electroline Automatic Dead-End is designed for use with neutral-supported type of service drop. The insulation on the phase wires is not destroyed because these Dead-Ends grip only the bare neutral. This eliminates the possibility of shorting any phase. Available only for No. 6-AWG conductor. For automatic line Dead-Ends use the Electroline 3400 Series.

THE ELECTROLINE 3800 SERIES Automatic Dead-Ends lower construction costs because they are easily installed in a few seconds. This Dead-End is assembled as a one-piece unit with no loose parts to be dropped or lost. One end of the flexible bail is detachable for use with a spool-type insulator or other types of supporting anchorages now in service. This feature permits quick and easy installation with only one part, other than the conductor, to be handled by the lineman.

ELECTROLINE 4000 ANCHOR BRACKET — The 4000 Series Service Bracket, for use on permanently multi-grounded neutral systems (ideal for use with 3800 Series Dead-Ends as illustrated below), permits quick and simple insertion of a closed bail or loop—supports the cable at any angle. Installation costs are further reduced since this method of anchoring eliminates the insulator and insulator hardware.

WRITE FOR NEW BULLETINS FOR FULL INFORMATION

TALENT TO ORIGINATE E ABILITY TO PRODUCE

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How will you Sectionalize

DO YOU USE SWITCHES THAT CAN

BREAK the CIRCUIT

UNDER ANY CONDITION?

(Except Short Circuit)

NOW YOU CAN JUST PULL THE SWITCH

When emergency strikes . . . when an energized line is down . . . the S&C Alduti enables you to drop the load—all of it—at once!

No need to go through complicated unloading preliminaries . . . no need to open main breakers causing otherwise unnecessary interruptions . . . outages are held to a minimum . . . line repair can go forward immediately.

The S&C Load Interrupter drops the load with no lost time, NO external arc, and with safety to the operator.

HERE ARE SOME OF THE FEATURES YOU'LL FIND IN THE S&C LOAD INTERRUPTER

- Positive, "clean break" switching
- Safety to operators
- Interruption of all load currents and charging currents
- Independence from adverse wind conditions

Only one switch—the S&C Alduti—can give you all of these essential performance features . . . can break the circuit, and do it with NO external arc.

This is why the Alduti Load Interrupter has gained wide preference among power men . . . why leading utilities everywhere specify it for sectionalizing.

S&C

SPECIALISTS IN

your System?

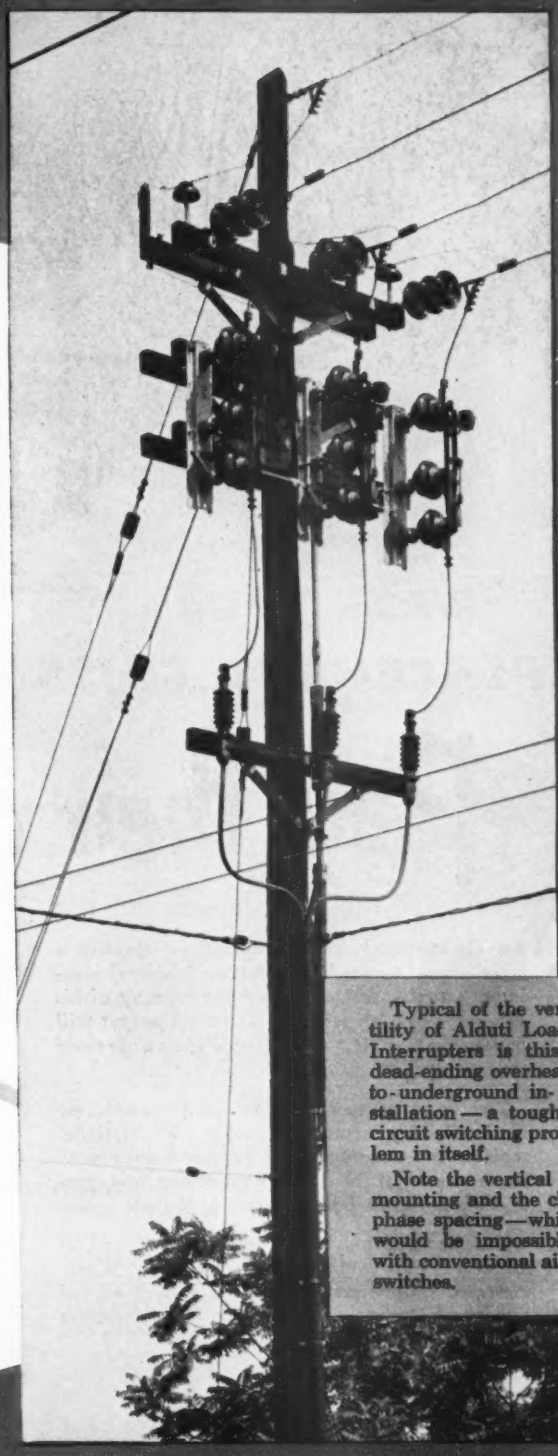
IF NOT, you are missing the kind of operating flexibility you get with the S&C Alduti Load Interrupter . . .

The Alduti Load Interrupter can be operated *any* time . . . instantly . . . without communicating down the line to find out whether load conditions permit switching . . . a very important advantage during storm and emergency conditions.

With the Alduti, switching operations can be carried out without sequencing with circuit breakers—an important advantage during storm or emergency.

And it can drop your *entire* load . . . individual loads never need to be removed as a preliminary.

Interested? Then write today for literature. It will give you new ideas on sectionalizing.



Typical of the versatility of Alduti Load Interrupters is this dead-ending overhead-to-underground installation — a tough circuit switching problem in itself.

Note the vertical mounting and the close phase spacing—which would be impossible with conventional air switches.

S&C ELECTRIC COMPANY

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formerly Schweitzer & Conrad, Inc.

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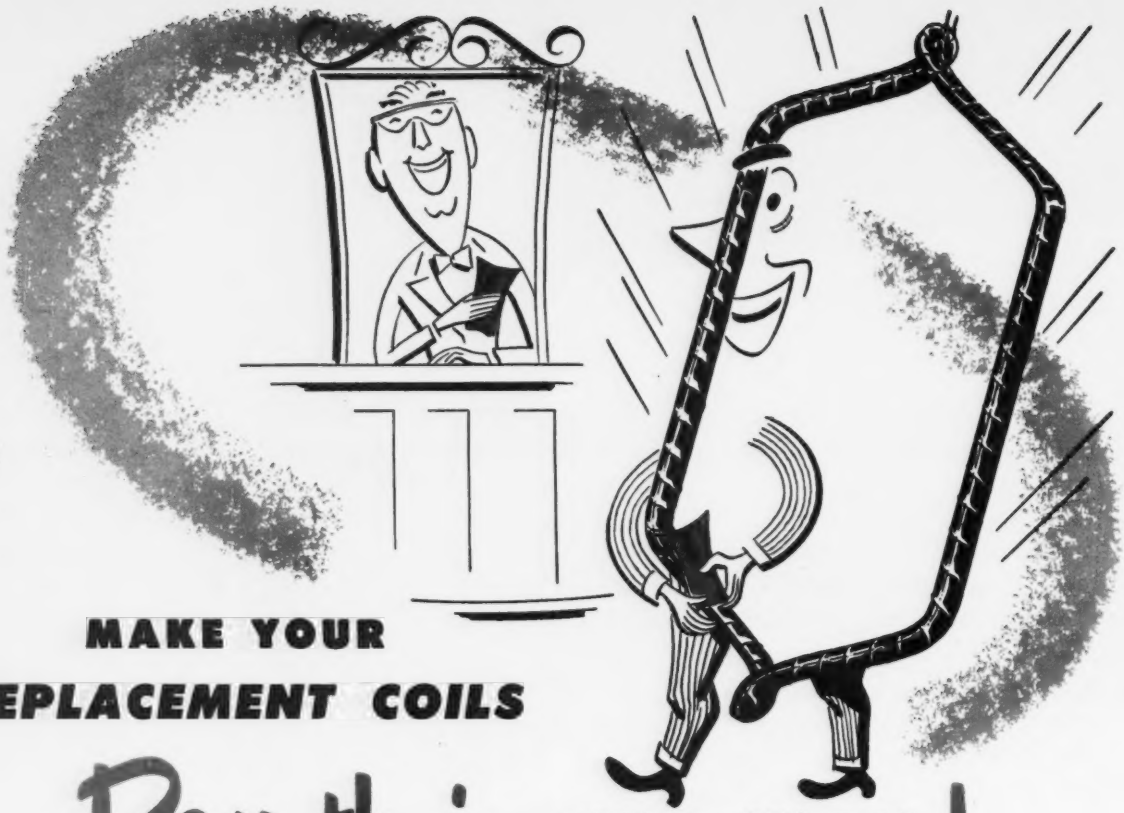
HIGH-VOLTAGE CIRCUIT INTERRUPTION



MAKE YOUR

REPLACEMENT COILS

Pay their own way!

An electro-metalurgical producer is drawing a large annual power bonus because National maximum-capacity design boosted the capacity of his generator by 15.9 per cent. Increased output will pay for the complete rewinding job in a little more than two years.*

"As good as new" is *not* good enough for National. A generator or motor with National replacement windings *must be better than new.* Every phase of National engineering and production is directed toward this objective.

Redesign for maximum capacity is typical of extras you can count on from National. Where increased output can be used or sold, National replacement windings will pay for themselves over a very short period of time. Where it cannot be utilized, extra capacity reduces operating temperatures and results in substantially longer coil life.

If you operate heavy rotating electrical equipment for any purpose, you can operate it more profitably with National windings. Get in touch with your nearby National field engineer today. Find out how National maximum-capacity design and National extra-quality coils can help your motors and generators do a better job.

*Complete details on this installation available on request.

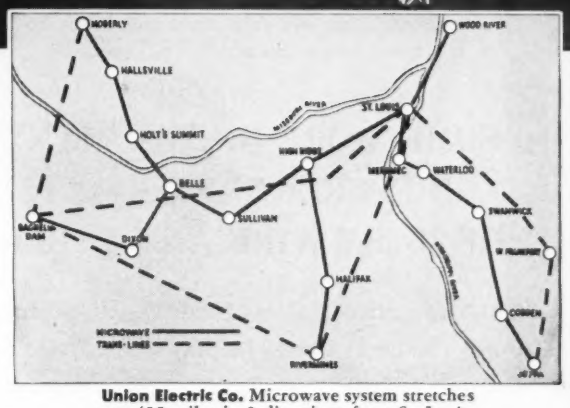
NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.

ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION—
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

RCA Microwave radio relay installation at High Ridge, Mo. Towers are rugged, designed to withstand 100-mph winds under severe icing conditions.

Osage Hydroelectric Power Plant installation of Union Electric Company of Missouri, at Bagnell Dam, Mo.—serviced by RCA Microwave.



Union Electric Co. Microwave system stretches out 425 miles in 3 directions from St. Louis.

How UNION ELECTRIC solved today's communication problem

Two years ago Union Electric Company of Missouri ran into the communication problem which sooner or later confronts all growing utilities: their high-line carrier transmission system had become inadequate.

The 150 kc bandwidth, allotted for power line carrier operation, permits the use of only a relatively few channels which are not sufficient to meet all the requirements of a modern communications system. Direct wire lines were ruled out as too costly.

That prompted engineers to adopt Microwave, supplemented with mobile radio at major relay points. RCA Microwave provides channels for remote control of load dispatching, telemetering, teletype and voice communication. It results in close co-ordination of vehicles, field crews, executive and service personnel at outlying offices and stations. And, 70% of the RCA Microwave system is available for future expansion.

RCA Microwave can be interconnected with existing phone lines and switchboards. It uses familiar channeling circuits and readily available tubes. It provides as many channels as needed with minimum use of frequency space.

Now Union Electric has dependable, year-round communications over the full length of its operations. RCA "dish" antennas atop 100- to 300-foot towers, spaced 11 to 46 miles apart, send concentrated beams of radio energy from station to station. The radio beams follow a line-of-sight path—approximately parallel to the transmission lines.

You, too, can plan now for tomorrow's problems—prepare for your expanding communications needs before they develop. The booklet listed below provides quickly digested facts for future thinking, *with no obligation on your part.* Mail the coupon. *Remember,* only RCA can provide the nation-wide service facilities of the RCA Service Company.

RADIO CORPORATION of AMERICA
COMMUNICATIONS EQUIPMENT CAMDEN, N. J.

Dept. 45WB, Building 15-1

Please send me your reprint describing Union Electric Microwave system, *"Microwave Relieves Overloaded Circuits."*

Name_____ Title_____

Company_____ Address_____

City_____ Zone_____ State_____

☐ Have an RCA representative get in touch with me.

ELECTRICAL INSULATION IS OUR SPECIALTY

Q. *What ONE wire and cable producer grows its own natural rubber, and makes its own synthetic rubber?*

A. UNITED STATES RUBBER COMPANY.

Q. *What ONE wire and cable producer makes plastics?*

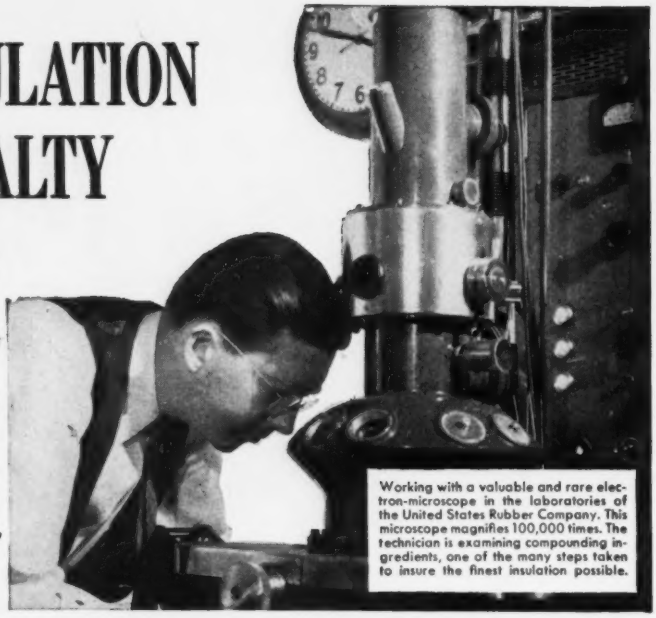
A. "U. S."

Q. *What is the most important part of wire and cable?*

A. The insulation.

Q. *Who is best equipped to make wire and cable with superior insulation?*

A. U. S. RUBBER—which grows its own natural rubber, makes its own synthetic rubber, manufactures its own plastics.



Working with a valuable and rare electron-microscope in the laboratories of the United States Rubber Company. This microscope magnifies 100,000 times. The technician is examining compounding ingredients, one of the many steps taken to insure the finest insulation possible.

Isn't it logical that a rubber company should make the best wire and cable insulation there is? U. S. Rubber has been a pioneer in insulation for over 70 years—has amassed in that time a stockpile of research data and experience that can't be beat. Electrical insulation is a "U. S." specialty!

Electrical insulation makes the difference between superior and ordinary wire and cable. Conductors of all manufacturers are standard, but insulation must be the best that science can produce. That's why your best bet in wire and cable is U. S. Rubber.

SOME MORE OF THE MANY DIFFERENT VARIETIES OF "U. S." WIRE AND CABLE

UTILITIES: Power Cables • Street Lighting • Royal Cords • Network Cables • Utility Control • Pole & Bracket Cable • Service Entrance • Weatherproof • Zip Cord Pole Fixture Cable • Sup. Control

RAILROADS: Power Cables • Communications • Railway Signal • Royal Cords • Welding Cable • Railway Utility • Sup. Control • Weatherproof

HEAVY INDUSTRY: Power Cable • Royal Cords • Welding Cables • Control Cables • Machine Tool Wire • Building Wire • Switchboard Wire • Thermostat Cable • Bus Drop Cable

ONE OF MANY SUPERIOR "U. S." WIRE AND CABLE PRODUCTS

USKORONA-NEOPRENE POWER CABLES

Ozone-resistant for high-voltage applications in wet or dry locations.

These cables are for use on power distribution, street lighting and station control circuits and for general-purpose wiring on circuits up to 8000 volts between phases and at conductor temperatures up to 75 C. They will not crack after 3 hours in air containing .015 per cent ozone. They are light in weight, easy to install and join, and are resistant to oil, heat, sunlight, flame, acids, alkalis and corrosive chemicals. Uskorona-Neoprene cable also eliminates electrolysis. The following are guaranteed test values:

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	Uskorona			Neoprene Jacket	
	Unaged	After 96 Hrs. O.B.	After 7 Day Geer Oven	Unaged	After 96 Hrs. O.B.
Tensile Lbs./Sq. In.	500	450	450	1800	1600
Elongation Per Cent	250	200	200	300	250

MOISTURE RESISTANCE (MAXIMUM VALUES)

Dielectric Constant and Power Factor of the insulation after immersion in water at 50 C.: Dielectric Constant, one day is 4.5; per cent gain, 1 to 14 days is 5.0; per cent gain, 7 to 14 days is 2.0; Power Factor, per cent, one day is 3.0; Stability Factor 40-80 volts/mil two weeks, per cent is .5.

U.S.RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

ELECTRICAL WIRE & CABLE DEPT. • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

New Outdoor Current Transformer IS LIGHTER, TAKES LESS SPACE

COMPARE THESE FIGURES

KV	DESIGN	FLOOR SPACE	HEIGHT	GAL. OIL	WEIGHT (lbs.)
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	Previous Type	22" x 22"	33"	15	490
34.5	New Type SCW	14" x 19"	45"	9½	230
	Previous Type	22" x 22"	33"	15	490
46	New Type SCW	16" x 23"	55"	16	475
	Previous Type	23" x 23"	40½"	18½	500
69	New Type SCW	16" x 23"	61"	18	525
	Previous Type	28½" x 28½"	46½"	35	1000

ALLIS-CHALMERS INSTRUMENT TRANSFORMERS

Here is a completely new line of current transformers for outdoor use on power circuits 69 kv and below. They bring you many new design features that result in excellent performance, high thermal and mechanical strength, plus mechanical advantages that simplify installation.

Most important, their ruggedness has been proved by exhaustive tests. Temperature rise at normal current is low, allowing ample overcurrent in emergencies. The transformers are rated 65 times normal primary current under short circuit conditions. Corona-free design extends insulation life.

For the complete story get your copy of the paper "Progress in Instrument Transformer Design" by writing Allis-Chalmers, Milwaukee 1, Wisconsin. A-4110

ALLIS-CHALMERS

Varied problems?

BUTT OR LAP JOINTS AT ANY ANGLE

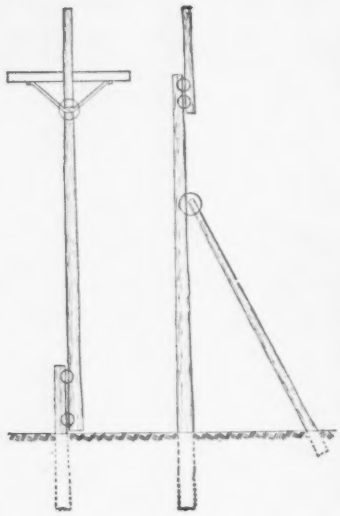
WOOD TO WOOD

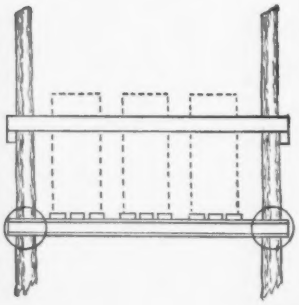
ROUND TO ROUND
ROUND TO DIMENSION
DIMENSION TO DIMENSION

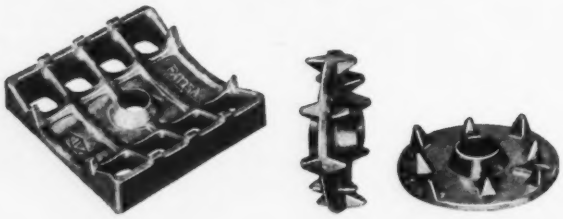
WOOD TO METAL

Versatile answer!

M.I.F. GRID GAINS and TIMBER CONNECTORS







M.I.F. Grid Gains and Timber Connectors are adaptable to dozens of different applications — they make STRONGER, MORE DEPENDABLE CONNECTIONS.

Tests show that shear forces four to five times greater than could be resisted by a single through bolt are attained by using Grid Gains or Timber Connectors.

M.I.F. Grid Gains and Timber Connectors permit fuller utilization of the strength of wood by allowing higher design loads in shear — for both permanent and emergency construction. No special tools required for installation.

We have the story for you in our Bulletin PH10. Write us.

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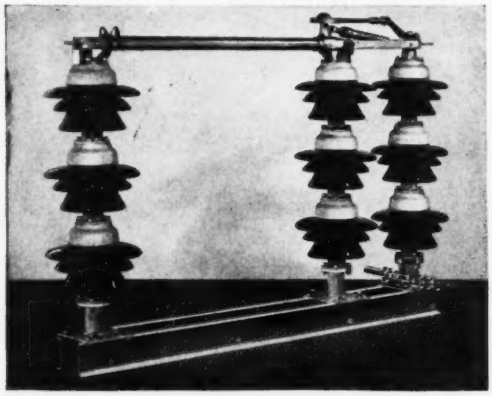
90% less wear on switch parts

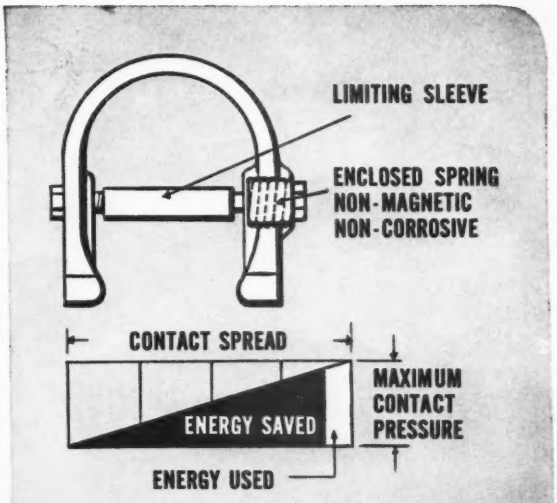
3E 8400 Airbreak Switch uses exclusive limiting sleeve for easy closure and long wear

When the blade pressure on an 8400 Airbreak Switch is released, a 3E patented limiting sleeve takes on 90% of the spring pressure. Thus when contact is closed again the switch has to rebuild only 10% of the balanced high pressure . . . the illustrations and graphs at the right show how 3E gives you these important advantages.

1. Minimum amount of energy required to set up contact pressure, resulting in minimum wear.
2. Practically no variation in contact pressure due to wear, or over or under mechanism travel.
3. Visible indication of correct contact pressure by free limiting sleeve.

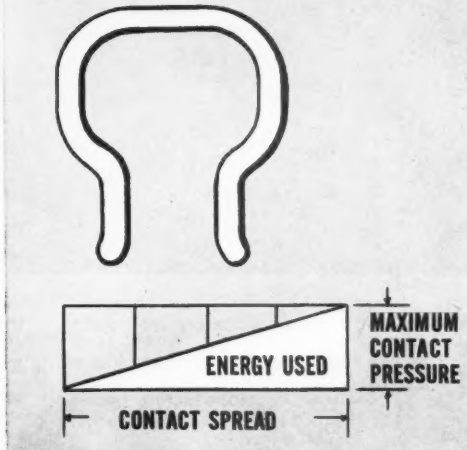


115 KV, 600 ampere, 8400 type Airbreak Switch.



MODERN 3E DESIGN

CONVENTIONAL DESIGN



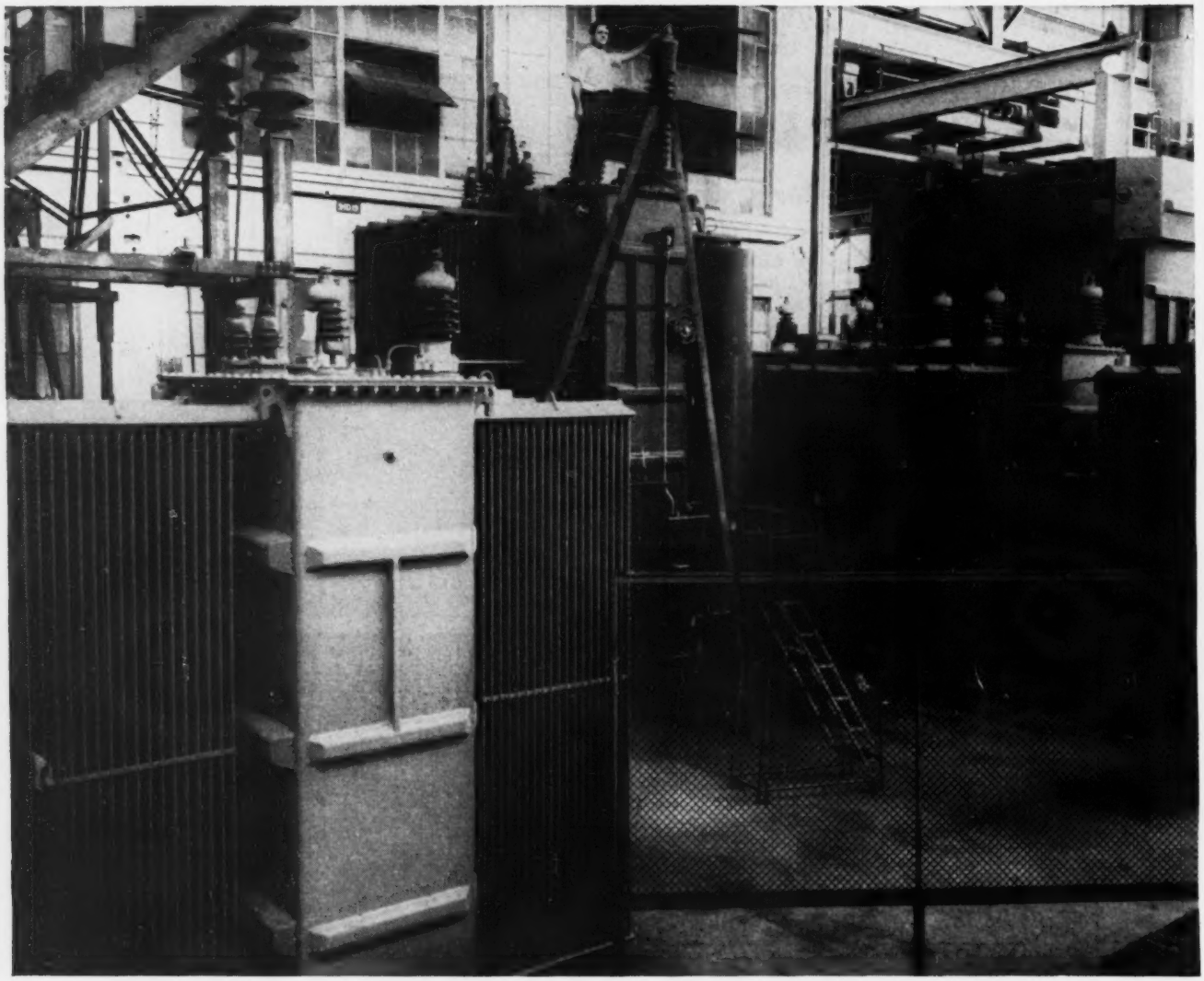
3E

FOR FULL DATA WRITE
FOR NEW BULLETIN 327

8400 AIRBREAK SWITCH

ELECTRICAL ENGINEERS EQUIPMENT CO. MELROSE PARK, ILL.

Wagner POWER



A typical group of Wagner Transformers nearing completion at the Wagner plant. Wagner has all the facilities necessary to manufacture power transformers up to 60,000 kva. Bulletins TU-180 and TU-181 give information on the complete Wagner Transformer line. Write for your copies.

Wagner Electric Corporation EST. 1891

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

TRANSFORMERS

built to provide utmost reliability and service continuity . . .

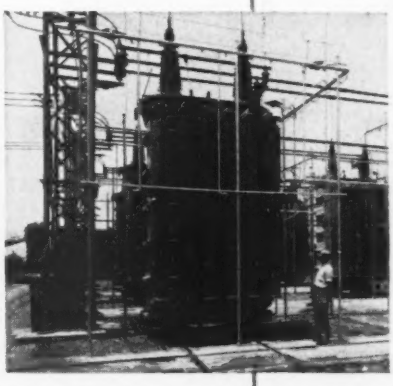
Wagner has been building power transformers for more than sixty years. The knowledge gained and the facilities acquired in all those years make the building of fine power transformers part of the day's work at Wagner.

Years of engineering "know-how" —Wagner's insistence on the use of only the highest quality materials—carefully controlled production methods—rigid inspections and tests all combine to assure users power transformers that will provide utmost reliability and service continuity.

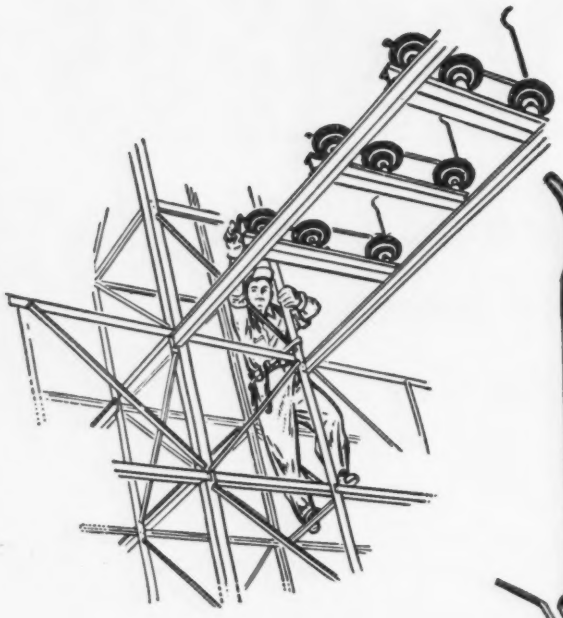
That's why you will find Wagner Power Transformers the first choice of a great many industrial and power companies. That's why it will pay you to consult Wagner on your next power transformer installation. Wagner maintains thirty-two branch offices, located in principal cities, for quick convenient engineering service and consultation.

Wagner
TRANSFORMERS
. . . the choice of leaders in industry

This Wagner Power Transformer, rated 20,000 / 25,000 / 33,000 kva, is installed in a midwest power plant.

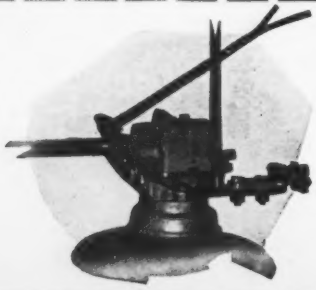


One of ten oil-filled Wagner Power Transformers, each rated 5000 kva self-cooled, 6667 kva forced air-cooled, at a substation in New Orleans.



only talks

Available
200 TO 3000 AMPERES
7500 TO 287,000 VOLTS



EXCLUSIVE CONTACT HOUSING

Protects contacts against sleet, dirt and arcing. Also acts as an ice breaker.

HI-VOLTAGE

Hi-Voltage installation savings

No wonder. Only Hi-Voltage reduces switch installation cost from 20 to 40 percent.

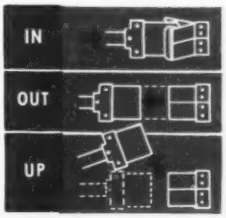
Fine engineering is the reason. Every part is designed just right, and Hi-Voltage takes time to assemble and to completely test each switch before shipment. When your crews start assembly, they find all parts clearly identified and keyed to easy-to-follow installation instructions. There's no field cutting or drilling. We've even made your final adjustments.

Your Joslyn Salesman will tell you more about installation savings and other exclusive advantages of Hi-Voltage Switches. Ask him or write Hi-Voltage Equipment Company, 4000 East 116th Street, Cleveland 5, Ohio.

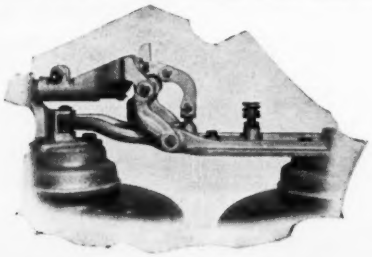
SILVER-NICKEL CONTACTS

Combine low resistance with low friction. Stainless steel springs maintain maximum conductivity.

IN-OUT SWITCH ACTION



Straight-line motion of the switch-arm provides positive opening and closing of the switch. No twisting or turning.



OPERATING MECHANISM

A direct mechanical linkage. Uses no cams or rollers to deliver smooth powerful action. There is nothing to stick, bind or adjust.

EQUIPMENT COMPANY

4000 EAST 116TH STREET · CLEVELAND 5, OHIO

SANGAMO . . . the Demand Registers with service experience

Economical operation of demand meters depends on how often the registers must be given necessary maintenance.

Sangamo's New Service Manual recommends that Sangamo Demand Registers be subjected to only a *minimum* of preventive maintenance. Field service records show that these registers operate satisfactorily for from 4 to 12 years.

HERE ARE THE REASONS Type JH and LCH Registers can give such performance . . .

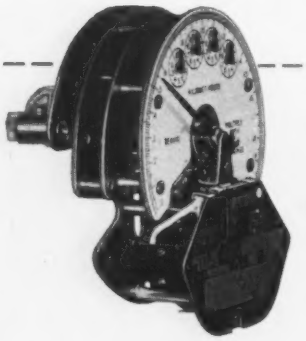
1. The exclusive Sangamo-built slow speed, high torque motor with porous, lubricant-saturated bronze bearings. Result: *No motor trouble.*

2. Hardened steel pivots and porous lubricant-saturated bronze bearings. Result: *Friction does not develop in timing gearing.*

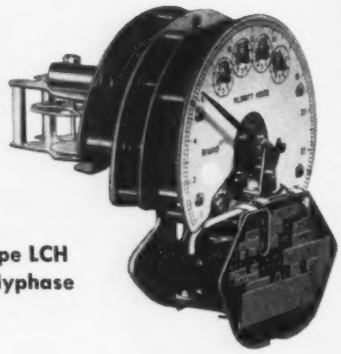
3. Jewelled bearings in resetting mechanism. Result: *Makes resetting positive and friction-free.*

These design features assure economical operation and complete satisfaction.

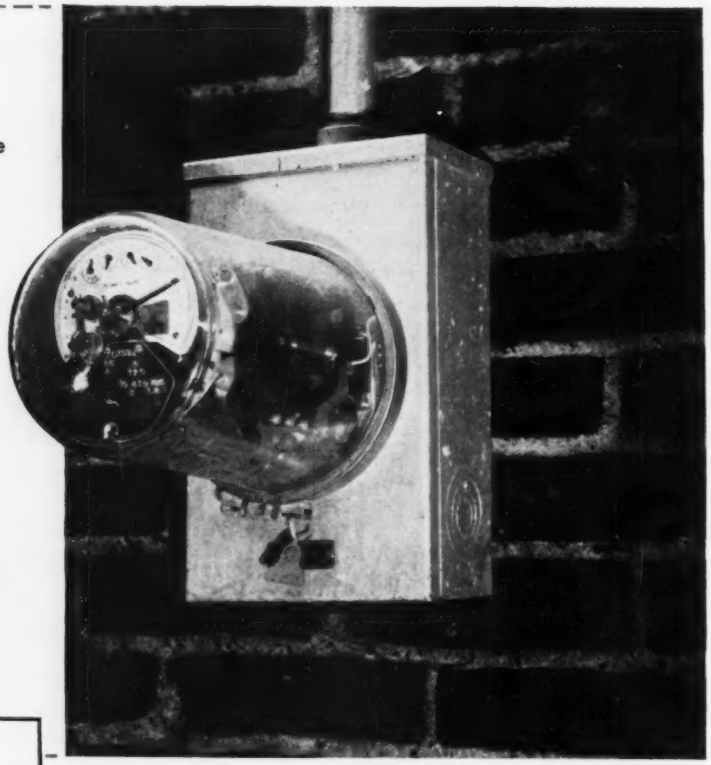
Write for your copies of Descriptive Bulletins No. 311 and 321, and for Service Manual No. 390.



Type JH
Singlephase



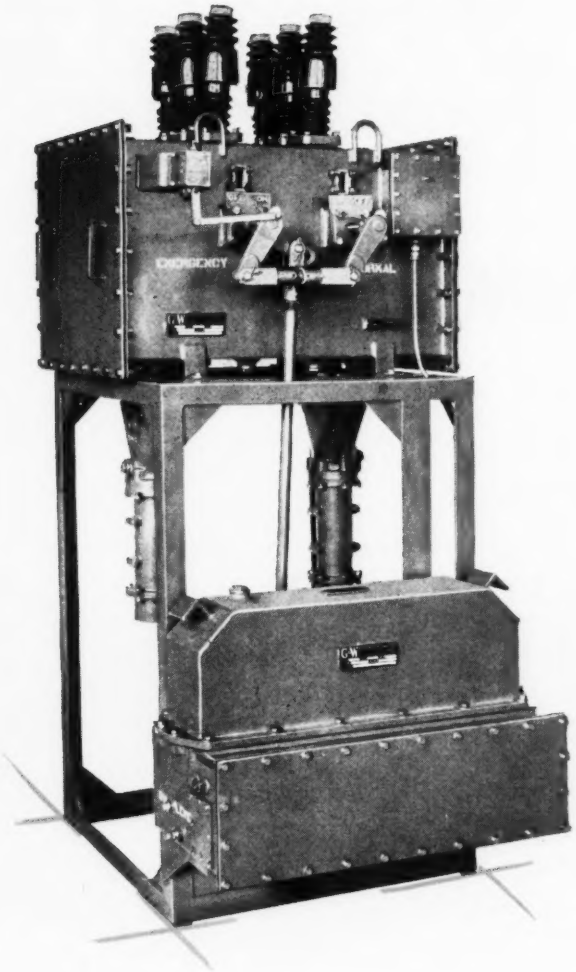
Type LCH
Polyphase



SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Only Measured Facts are Known Facts

PROVIDE SERVICE CONTINUITY BY AUTOMATICALLY TRANSFERRING LOAD TO AN ALTERNATE FEEDER

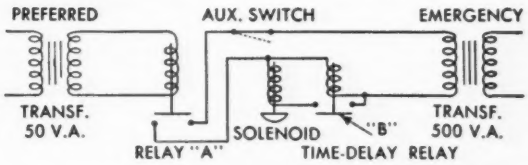


"RA" OIL SWITCHES

The unit illustrated has two "RA" single throw oil switches for the preferred and emergency feeders which are terminated in the bottom cableheads. The load is connected in parallel to the two sets of porcelain enclosed disconnects on top. Either switch can be isolated.

Alternate units with "RAD" double throw oil switches with or without air-break isolating links are also available.

MODEL "E" MECHANISM



The load is automatically thrown from preferred to emergency feeder when preferred feeder voltage fails. The load is automatically thrown back from emergency to preferred feeder when preferred feeder voltage is restored (for a period of 2½ minutes). There is no "hunting" on system disturbances. Load cannot be thrown to a "dead" source.

Control transformers are located in the oil switch tanks. All control wiring is done at the factory.

Installation of the unit merely involves termination of feed and load cables.

Write us or our representatives for Bulletin DA 50. Send cable data and describe installation conditions for quotation on automatic transfer oil switches to meet your requirements.

D-532

G&W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Ill.

Cable Terminating, Connecting and Sectionalizing Devices
Representatives in principal cities of U. S. A.
In Canada—Powerlite Devices, Ltd., Toronto and Montreal

It's Easy to Add Feeders

ON AN ALLIS-CHALMERS UNIT SUB

When System Growth
Demands Additional Substations,
Install Allis-Chalmers Unit Subs.
They are Simple to Specify,
Time-Saving to Install and Easy to Expand
for Future Needs.

WHEN LOAD GROWTH MEANS EXPANSION . . . add substations designed to do more than just meet your immediate needs — add Allis-Chalmers Unit Substations with built-in flexibility for the future.

Then when future residential or industrial growth necessitates additional feeders, they will be easy to add. Each feeder of an Allis-Chalmers Substation is a complete unit in itself and is easy to install.

Here's How Feeders Are Added

Remove the bolted-on plates that cover the pre-cut bus and wiring openings . . . also remove the roof splice plate from the end feeder. Now bring the new feeder into position. You'll find correct alignment is easy, insured by jig-built construction. Replacing the gasketed roof-splicing plate completes mechanical connections.

Electrical connections are also simple to make. The predrilled, silver-plated bus extensions are bolted together. Easy-to-apply no-corona tape and insulating tape finish the joint. There's no compound to melt, chip, scrape, or crack. Control wiring is easy to connect because terminal blocks are grouped . . . located for ready access.

That's it! Connect feeder cables and the job is done.

MCS Unit Substations are a convenient answer to the growing distribution problem . . . to the ever increasing demand for power and yet more power. They are simple to specify, neat and modern in appearance, easy to expand, and they save you money these five ways:

(1) Original equipment cost is low; (2) compact construction reduces space requirements and real estate costs; (3) pre-wired unit design speeds installation; (4) maintenance is quick and economical because of improved accessibility, and (5) you purchase only the feeders you need *now*, deferring additional expenses until load growth demands them.

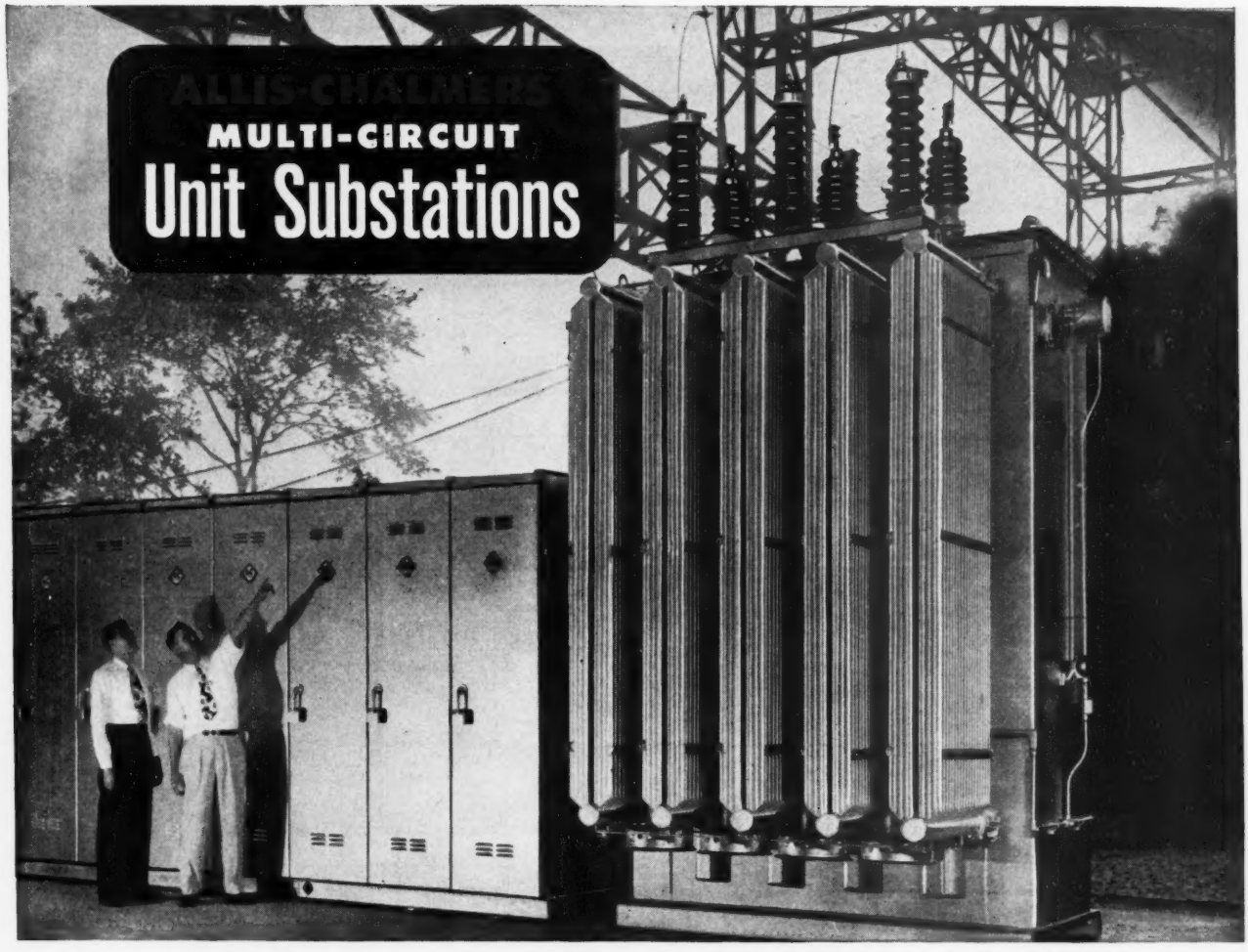
For the full story on what Allis-Chalmers Unit Substations can mean in your distribution system, call your nearby A-C representative, or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-3544

ALLIS-

ALLIS-CHALMERS

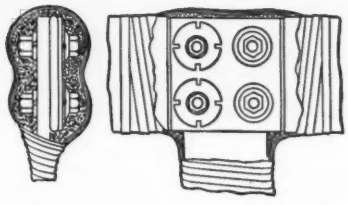
MULTI-CIRCUIT

Unit Substations

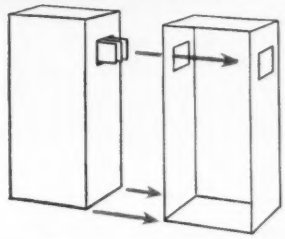


Here's Why Feeders are Easy to Add...

1 **FEEDER UNITS** are jig-built so that each feeder cubicle is exactly like every other one. Bus extension openings, control wiring openings . . . even small screw holes . . . are pre-cut in jigs. This careful, uniform construction makes field assembly easy. Just move the new feeders into position. Alignment is perfect.



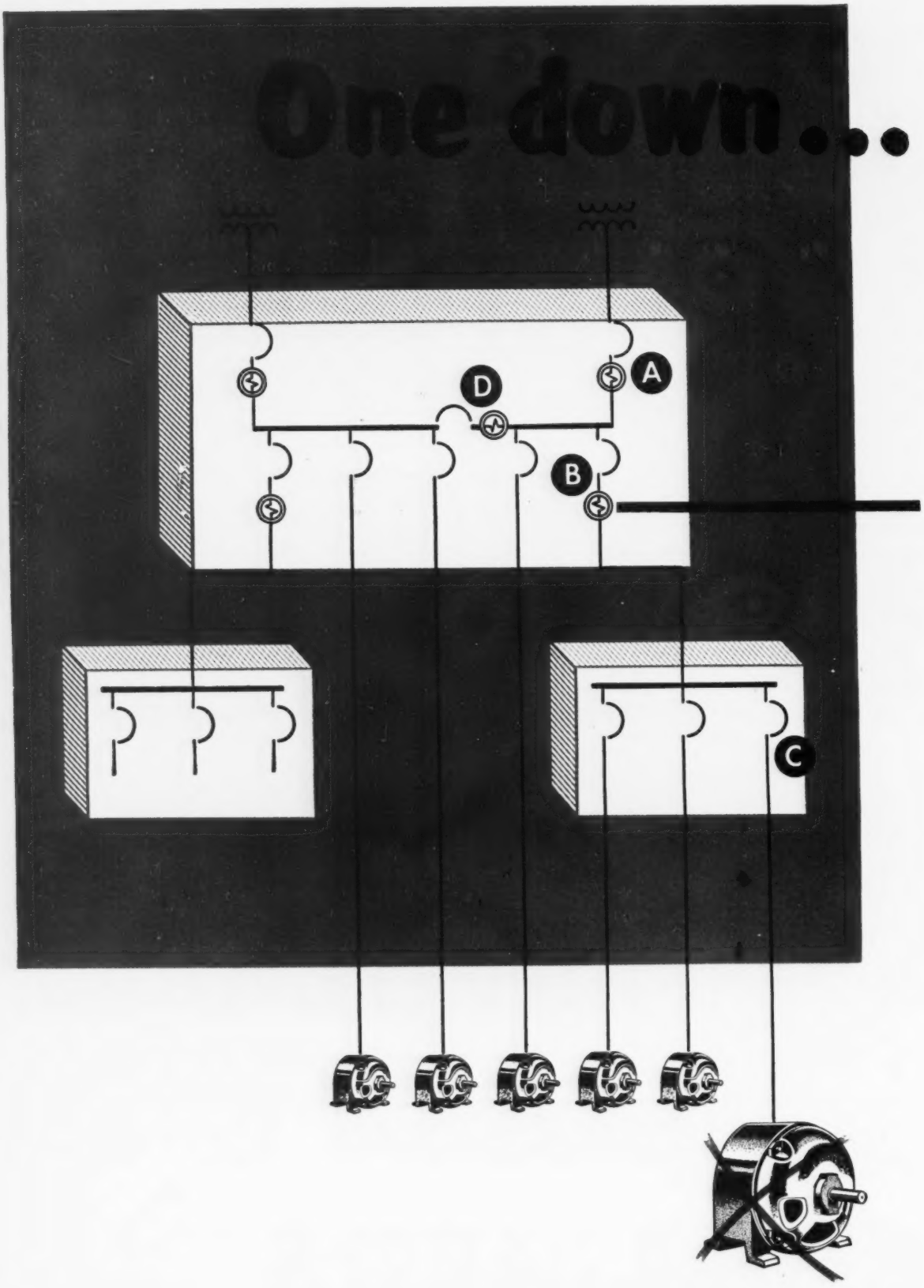
2 **BUS JOINTS** are easy-to-make in the field. Bus extensions are pre-drilled and silver-plated . . . designed for quick, easy bolting together. No-corona tape covers the bolted joint . . . speeds the job by providing a smooth taping surface. Insulating tape finishes the joint. There's no compound to melt or apply.



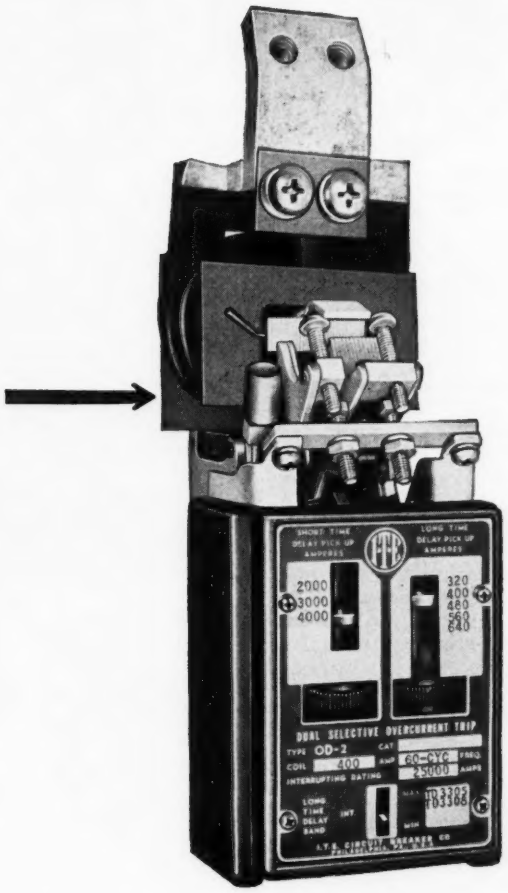
3 **EACH FEEDER** is an individual unit . . . complete with two side panels, roof and floor. All enclosed parts are protected from the weather, dust or mechanical injury even during the last minutes of installation. Gasketed roof-splicing pieces fit easily into place forming a weatherproof seal.

CHALMERS

A-C ALLIS-CHALMERS


One down...
A
B
C
D

or shutdown?



Selective tripping on I-T-E Circuit Breakers isolates system faults, boosts system reliability

What selective tripping is

Selective tripping is the economical means for providing reliable electrical service with complete freedom from general interruption. With selective tripping, several circuit breakers may be used in series; yet on overcurrent or fault, *only* the faulted circuit is interrupted.

What it does

Consider the following cases for a typical low-voltage system:

Without selective tripping—the overloaded motor in the diagram at left could cause breakers C, B, D, and A to trip, shutting down a boiler, a plant, or an entire system. This *will* happen, if the system does not include circuit breakers equipped for selective tripping.

With selective tripping—only breaker C will trip. A motor saved, one circuit interrupted, while *the rest of the system continues to operate—unaffected.*

Consider I-T-E selective tripping for your system

In central stations, in manufacturing plants, in the processing industries—I-T-E selective tripping has saved in initial investment, boosted system reliability, and reduced breaker maintenance. If you're planning a new low-voltage switchboard application, investigate the advantages of direct-acting I-T-E trip devices.

I-T-E trip device is a compact circuit breaker component

Selective tripping in low-voltage systems is easily applied with I-T-E Circuit Breakers. The breakers are simply equipped with compact I-T-E *direct-acting dual-selective overcurrent trip devices.* No expensive current transformers, no relays, no added switchboard panels are required. The trip devices are fitted as an integral part of the breaker.

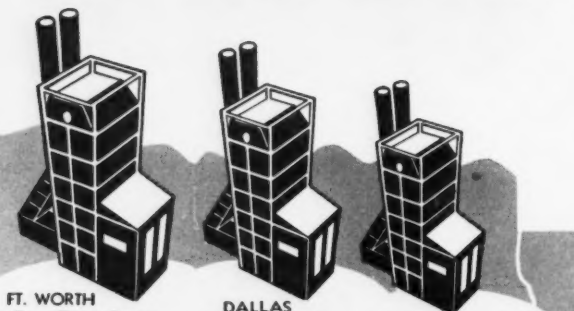
I-T-E

LOW-VOLTAGE SWITCHGEAR

I-T-E CIRCUIT BREAKER CO. • 19TH AND HAMILTON STS. • PHILADELPHIA 30, PA.

CANADIAN MFG. & SALES: EASTERN POWER DEVICES, LTD., TORONTO

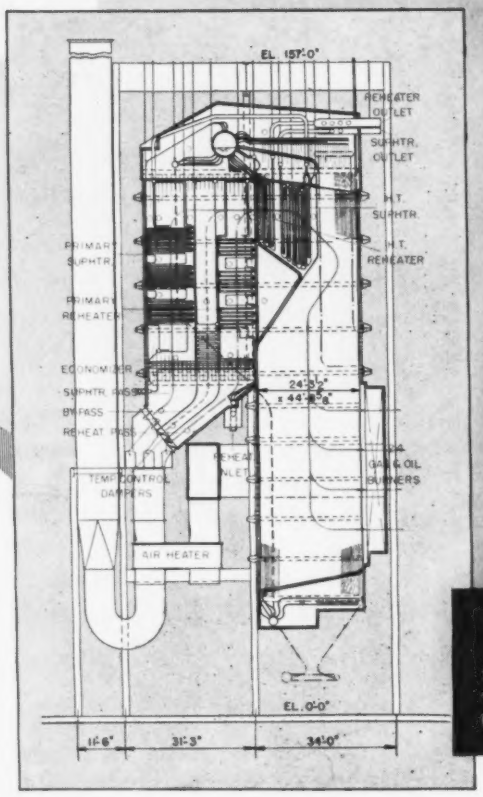
MORE POWER



FT. WORTH
Texas Electric Service Company

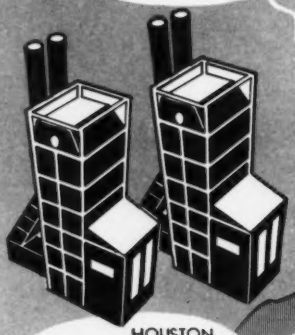
DALLAS
Dallas Power & Light Co.

LAKE CHEROKEE
Southwestern Gas & Electric Co.



RILEY Reheat Units Feature Damper Steam Temperature Control

In these Riley Reheat designs both steam and reheat temperatures are maintained constant by damper control. Dampers located below the economizer automatically proportion gases over primary reheater and superheater surfaces. At high loads, part of flue gas passes through open lane between superheater and reheater surfaces.



HOUSTON
Houston Lighting & Power Co.

TEXAS ELECTRIC SERVICE COMPANY — FT. WORTH

1,250,000 lbs./hr. capacity — 2125 psig
1005°F Superheat — 1005°F Reheat. Fired by Gas & Oil — Ebasco Services, Engineers

TRADE MARK Rx REGISTERED

RILEY
STOKER CORPORATION

WORCESTER, MASS.

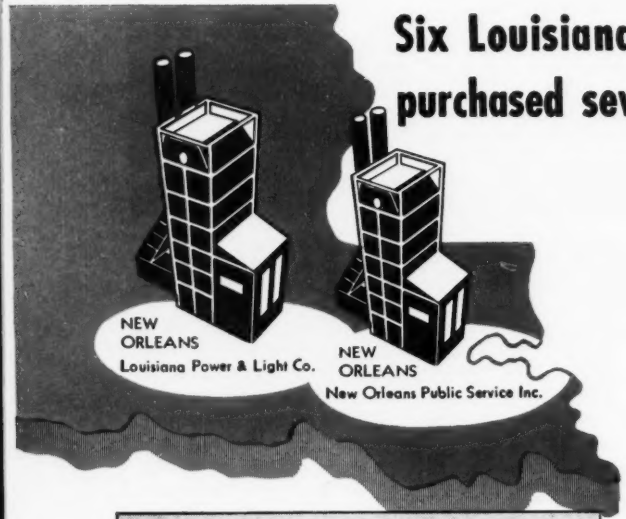
Boston, New York, Philadelphia, Buffalo, Washington, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Tulsa, Houston, Denver, Salt Lake City, Los Angeles, Portland, Seattle

COMPLETE STEAM GENERATING UNITS

BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • ECONOMIZERS
WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

TO THE SOUTH!

Recent Public Utility Orders Predominantly Riley . . . .



Six Louisiana and Texas Public Utilities recently purchased seven steam generating units from Riley

Louisiana Power & Light Company
1,000,000 lbs./hr. Reheat Unit—Ebasco Services, Engineers

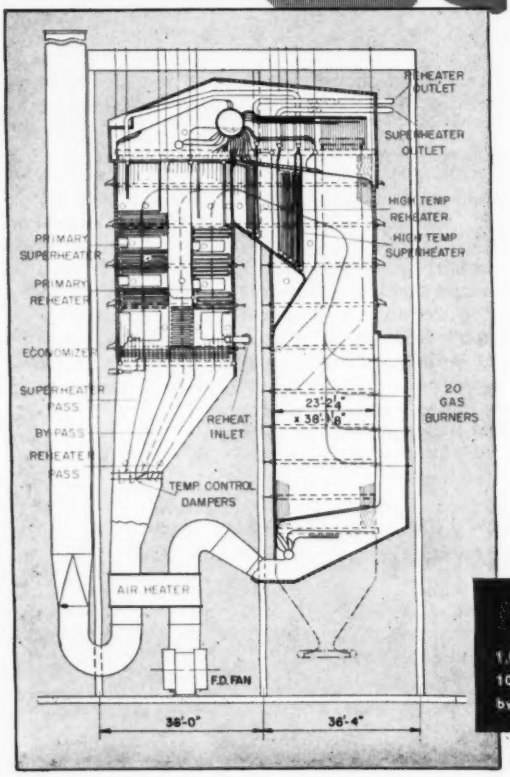
Texas Electric Service Company
1,250,000 lbs./hr. Reheat Unit—Ebasco Services, Engineers

Houston Lighting and Power Company
2—1,250,000 lbs./hr. Reheat Units—Ebasco Services, Engineers

Dallas Power and Light Company
1,050,000 lbs./hr. Unit—Ebasco Services, Engineers

New Orleans Public Service, Inc.
975,000 lbs./hr. Unit—Ebasco Services, Engineers

Southwestern Gas & Electric Company
650,000 lbs./hr. Unit—Sargent & Lundy, Engineers



LOUISIANA POWER & LIGHT COMPANY — NEW ORLEANS
1,000,000 lbs./hr. capacity — 1725 psig — 1005° F Superheat—1005° F Reheat. Fired by Gas & Oil—Ebasco Services, Engineers

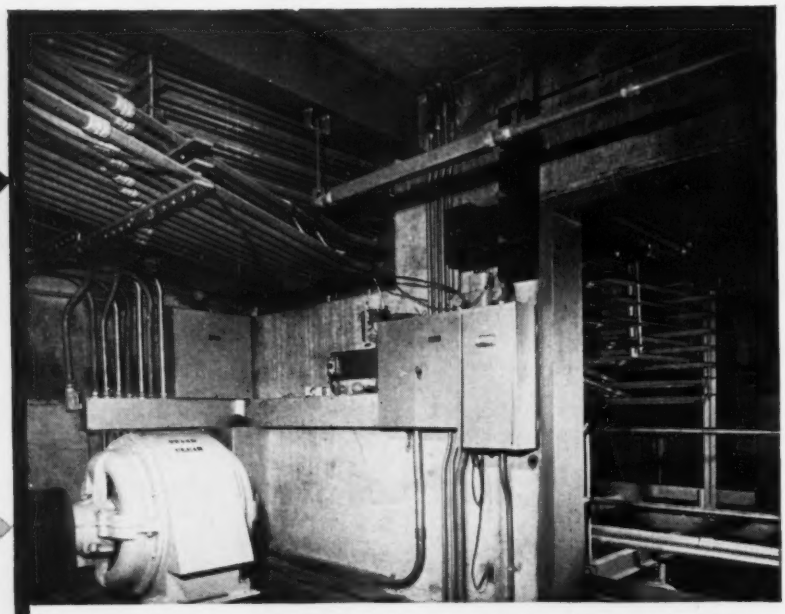
In 1953 an impressive array of Texas and Louisiana public utilities have teamed up with Riley. Houston Lighting and Power Company, long a satisfied Riley customer, recently ordered two Riley 1,250,000 lbs./hr. Riley reheat units, giving them eleven Riley units with a capacity of 6,890,000 lbs./hr. Texas Electric Service Co. has one Riley reheat unit on order. In addition, Dallas Power & Light Company will install a 1,050,000 lbs./hr. Riley steam generating unit, and only recently New Orleans Public Service, Inc. has ordered a 975,000 lbs./hr. Riley unit, its second Riley boiler.

In 1952, both Southwestern Gas & Electric Company and Louisiana Power & Light Company placed their first orders with Riley. Louisiana Power and Light Company's 1,000,000 lbs./hr. unit will be the World's first reheat unit fired by natural gas.

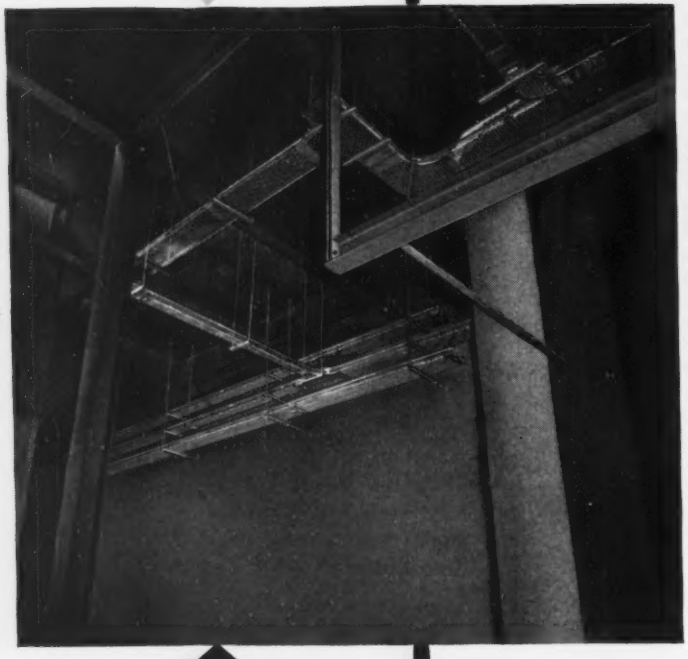
This sales record shows that when it comes to the largest steam generating units more and more public utilities are swinging to Riley. If you, too, are considering steam generating additions to your power facilities it will pay to learn first what Riley can do for you.

what a difference

what a saving



...with COPE CABLE TROUGH



SEEING IS BELIEVING! Here you can see at a glance the time, material and labor savings possible on cable installations through the use of Cope Cable Trough. Both of these photographs were taken at the City of Glendale (California) generating plant. The upper and older installation shows 126 - 1¼" conduits containing cables for controlling the auxiliaries for two turbine generators. Just look at the tremendous number of bends and fittings, and the complicated hanger construction needed to support this maze of conduit. You can imagine the high cost of engineering, material, and installation this entailed, even before the big job of pulling cable through the conduits was possible.

Now examine the lower, recent installation (view taken during construction) involving control of two additional generators, where cables for control conduits 480 volt auxiliary power, and 2400 volt auxiliary power are carried in Cope Cable Trough. It was a simple job to lay out and erect this trough using standard lengths and fittings. Costs were but a fraction of the older method; time and material were saved and accessibility for visual cable inspection is provided. Additional cables may be added with great ease.

You, too, can make such savings.

T.J. Cope INC.

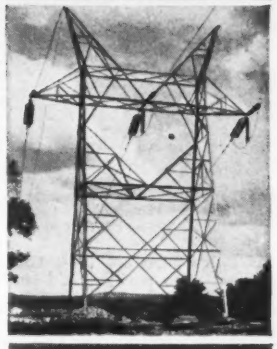
A detailed bulletin giving all the facts about Cope Cable Trough will be sent upon request. Write for it.

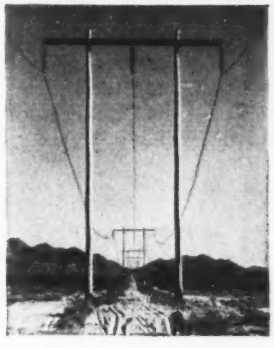
You know Cope by these products

711 SOUTH 50th ST. • PHILADELPHIA 43 • PA.

HIRED! A field man

FOR YOUR GOOD RELATIONS DEPARTMENT





Highest Quality Wet-Process Porcelain Shells made on the industry's finest automatic, completely hydraulic presses to assure uniformity and dependability in ALL units.

Not all good relations with the public are confined to the home office. Basically, it starts with the kind of equipment you use. Power failures won't make friends—only influence people to say adverse things about your service. Stay on the "Good" side of Good Relations. Buy Porcelain Products' dated, performance tested suspension insulators. They're built to keep working under the most extreme weather conditions. Write for prices and catalog information on our High Voltage Insulator line.

Porcelain Products, Inc.

PARKERSBURG, WEST VIRGINIA

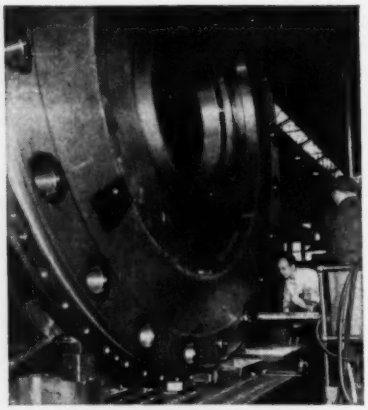
EXPORT REPRESENTATIVE:

Philips Export Corp., 100 E. 42nd St., New York 17, N. Y. U.S.A. Cable Address: "PHILYORK"

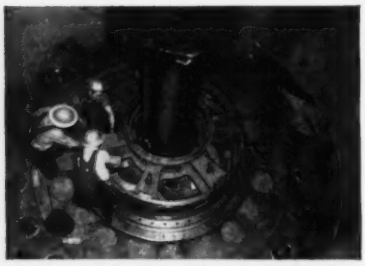
FOUR 17,000 HORSEPOWER BALDWIN FRANCIS TYPE TURBINES INSTALLED AT FORT GIBSON

FORT GIBSON DAM—This view shows (center of photo) the powerhouse in which these turbines are installed.

BALDWIN FRANCIS TYPE TURBINE RUNNER AND SHAFT shown above being lowered into position at Fort Gibson. The total weight of these two parts is 110,400 pounds.

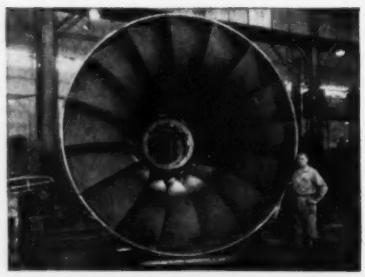


TURBINE MANUFACTURING requires lots of big, precise machine tools to handle the machining of large head covers such as the ones used at Fort Gibson.



THE HEAD COVER, MAIN BEARING AND MAIN SHAFT are shown in the above photo. The workers are busy positioning the guide bearing.

One of the foremost in the design and manufacturing of hydraulic turbines for over 100 years, Baldwin-Lima-Hamilton, together with its subsidiary, the Pelton Water Wheel Company, is among the few firms in the country with the facilities and experience required to produce such important equipment.



DISCHARGE END OF THE RUNNER is shown in this shop view prior to being shipped to the powerhouse site.

BALDWIN-LIMA-HAMILTON

Philadelphia 42, Pa. • Offices in Principal Cities

BALDWIN BLH LIMA-HAMILTON

Another specific reason why it's Kellogg . . . when reheat is the order!

OCCASIONALLY there arises a unique situation which specifically demonstrates why Kellogg has been selected so frequently to fabricate and erect the power piping for high temperature reheat units during the current power expansion period.

This one occurred during the installation of the piping for the Albany station of the Niagara Mohawk Power Corporation. In connection with improving the economics of the overall system, which includes the reheat cycle, Niagara Mohawk engineers developed a considerably simplified piping arrangement between the high pressure extraction heaters . . . one which eliminated customary expansion loops.

However, although this design had economic advantages, it posed a problem: Because of the absence of expansion loops, how severely would thermal expansion during the high heat of welding and heat treatment strain the flanges and bolts on the heaters? Excessive stresses on these joints might well cause leaks in service.

Since it is virtually impossible to calculate these forces with any accuracy, Kellogg called upon its stress analysis group to devise a procedure for controlling them. This was accomplished by the use of electrical strain gages mounted on supporting rods and on the heater shell as shown in the photograph. (See arrows)

As a result of readings taken throughout the cycle, standards were established for the field assembly of this design which assure protection of the flanged joints of these heaters.

Special groups which specialize in stress analysis with its required knowledge of mechanics of materials—of plastic and elastic theory . . . continuous research and development towards further improvements in materials and in fabricating and erecting techniques . . . continuous accumulation of a tremendous store of experience in fabricating and installing piping for more than six million KW's of output—these are among the reasons why "Reheat Power Piping by Kellogg" is so often the specification . . . 40 times within the recent expansion period.

These leading companies are among the many major producers of power who use M. W. KELLOGG POWER PIPING . . .

- Societa Meridionale Di Elettricita (Italy)
- Sociedad De Electricidad De Rosario (Argentina)
- Union D'Electricite (France)
- United Illuminating Co.
- Westinghouse Electric Corp.
- West Penn Power Co.
- Wisconsin Public Service Corp.

OTHER FABRICATED PRODUCTS including: Pressure Vessels . . . Vacuum Vessels . . . Fractionating Columns . . . Drums and Shells . . . Heat Exchanger . . . Process Piping . . . Bends and Headers . . . Forged and Welded Fittings . . . Concrete and Radial Brick Chimneys

For further information, details of methods, etc. contact

FABRICATED PRODUCTS DIVISION

THE M. W. KELLOGG COMPANY

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or offices in Jersey City, Buffalo, Los Angeles

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SUNBURY STEAM ELECTRIC STATION *(Unit 4)* —Sunbury, Penna.—Pennsylvania Power & Light Company.

AURORA STEAM ELECTRIC STATION *(Units 1 and 2)* —Aurora, Minn.—Minnesota Power & Light Company.

LAKE CATHERINE STEAM ELECTRIC STATION *(Unit 3)*—near Hot Springs, Ark.—Arkansas Power & Light Company.

18 Ebasco Projects Placed in Service in First Ten Months of 1953

Six More Scheduled for Completion by Year's End

Ebasco has completed 18 projects for business and industry so far this year—ten of which are pictured on these pages. By the end of the year, six more are scheduled for completion—a total of 24 different jobs for 21 different companies.

For the utility industry, Ebasco will complete during 1953 more than 2,000,000 kilowatts of electric generating capacity —almost 25 per cent of all the electric generating capacity scheduled to be installed during 1953 by America's investor-owned companies.

In addition to engineering and constructing power plants, Ebasco also handles engineering and construction for many other industries. Two examples are shown here—the Westinghouse plant at Columbus, Ohio and the Green River Steel mill at Owensboro, Kentucky.

If you are thinking of building a new plant, why not send for our booklet, "The Inside Story of Outside Help." It describes our engineering and construction services as well as the wide range of consulting services Ebasco offers business and industry. Write: Ebasco Services Incorporated, Department M, Two Rector Street, New York 6, New York.

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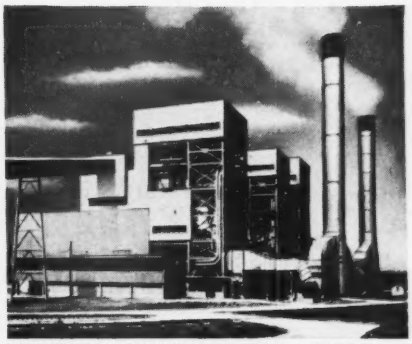
Ebasco Teamwork gets things done anywhere in the world

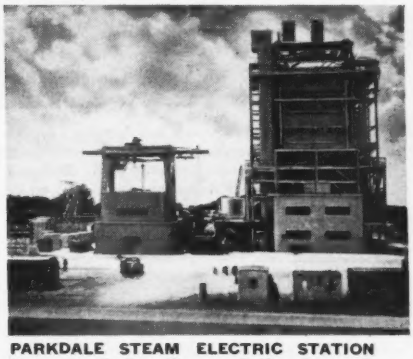
ENGINEERS · CONSTRUCTORS · EBASCO · BUSINESS CONSULTANTS

WESTINGHOUSE REFRIGERATOR PLANT — Columbus, Ohio—Westinghouse Electric Corporation.

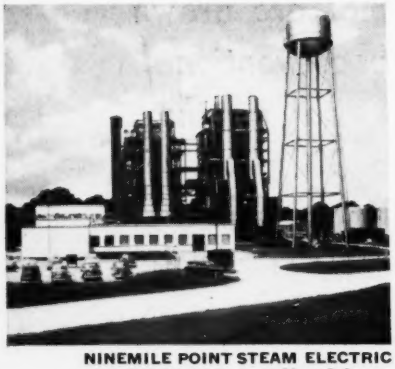
GREEN RIVER STEEL MILL—Owensboro, Ky.—Green River Steel Corporation.



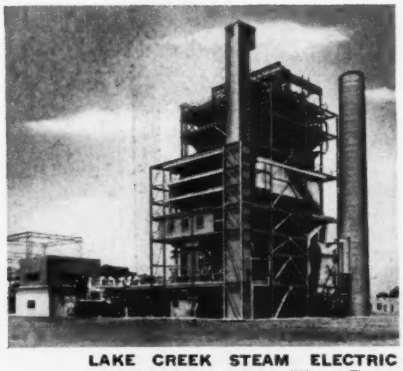
HAWTHORN STEAM ELECTRIC STATION *(Unit 3)*—Kansas City, Mo.—Kansas City Power & Light Company.



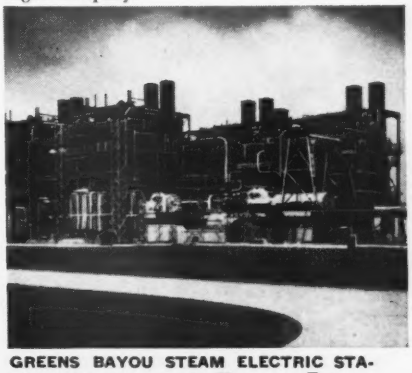
PARKDALE STEAM ELECTRIC STATION *(Unit 1)*—Dallas, Texas—Dallas Power & Light Company.



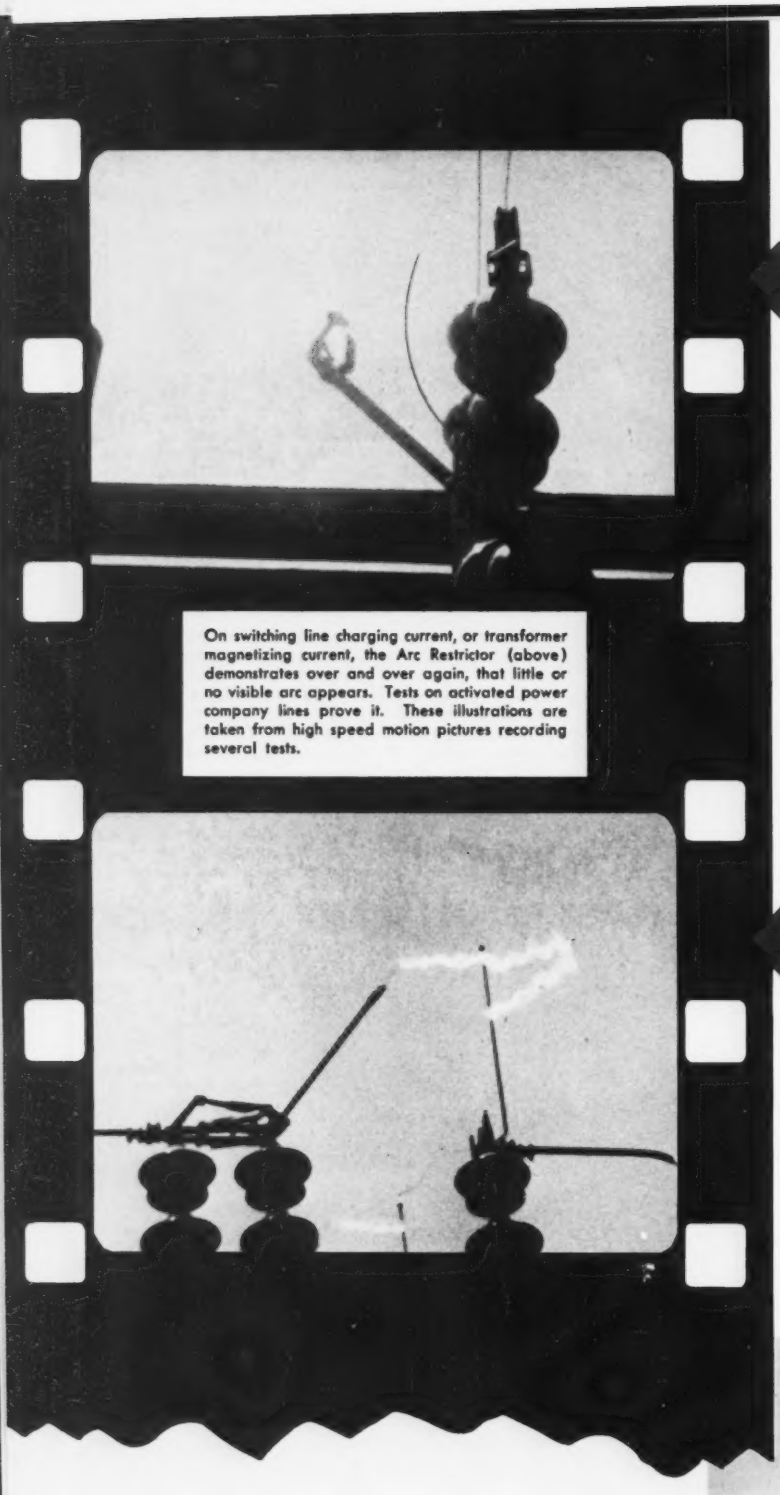
NINEMILE POINT STEAM ELECTRIC STATION *(Unit 2)*—near New Orleans, La.—Louisiana Power & Light Company.



LAKE CREEK STEAM ELECTRIC STATION *(Unit 1)*—near Waco, Texas—Texas Power & Light Company.



GREENS BAYOU STEAM ELECTRIC STATION *(Units 3 and 4)*—Houston, Texas—Houston Lighting & Power Company.



On switching line charging current, or transformer magnetizing current, the Arc Restrictor (above) demonstrates over and over again, that little or no visible arc appears. Tests on activated power company lines prove it. These illustrations are taken from high speed motion pictures recording several tests.

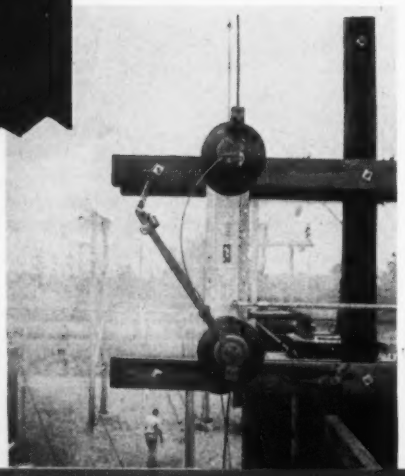
No arc visible

when interrupting 30 miles of 66 Kv. charging current with the . . .

R&IE ARC

SOLVES

Normal arc drawn by a conventional air switch on the same 30 miles of 66 Kv. charging current.



All parts visible.
No enclosures.
No maintenance.
Easily inspected on sight.

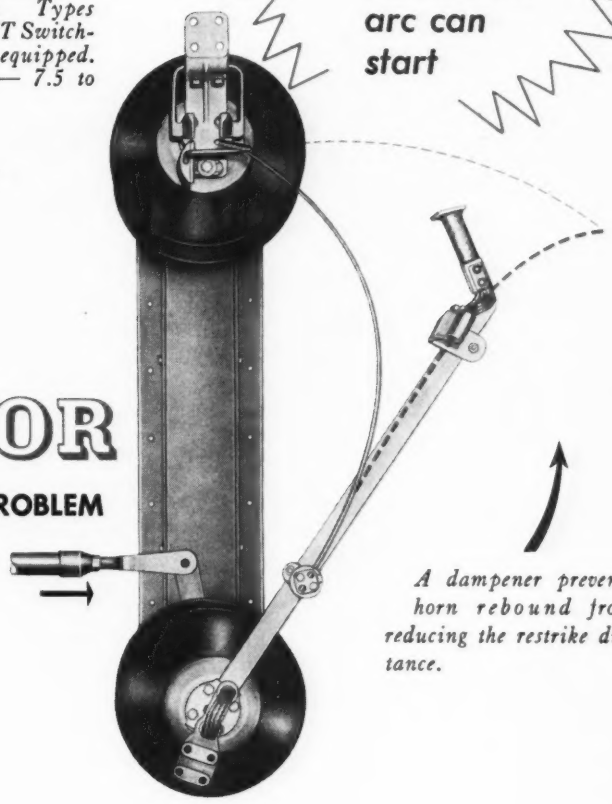
FORTY-THREE YEARS OF PIONEERING FOR THE ELECTRICAL INDUSTRY.

RESTRICTOR

AN IMPORTANT SWITCHING PROBLEM

Shown is a standard 69 Kv, type A switch with Arc Restrictor. Types TTR49 and TTT Switches can also be equipped. Voltage range — 7.5 to 115 Kv.

SNAPS *before the arc can start*



A dampener prevents horn rebound from reducing the restrike distance.

• *Start now to make real savings on 90% of your "live" switching operations*

Line Charging Current or Transformer Magnetizing Current can now be interrupted with amazing economy. A simple ARC RESTRICTOR can easily be furnished to new switches or quickly attached to switches already installed.

Reduce the mental and physical hazard to your operator. Eliminate those long, crackling arcs. Improve morale and efficiency.

Reduce the investment of more costly types of circuit interrupters. Eliminate costly maintenance. Switch to the Arc Restrictor and you'll switch safely.

R&IE SWITCHING EQUIPMENT

DIVISION OF I-T-E CIRCUIT BREAKER CO.

Greensburg, Pa.

STRUCTURES—steel or aluminum • TESTING DEVICES • KIRK KEY INTERLOCK SYSTEMS • ISOLATED PHASE BUS STRUCTURES • INTERRUPTER SWITCHES

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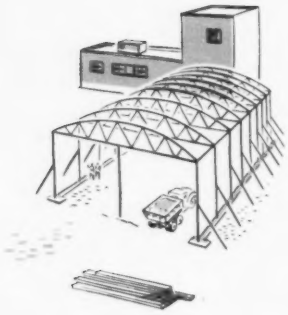
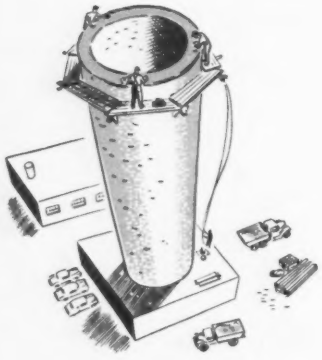
LOAD BUILDERS

INSULATOR SABOTEURS!





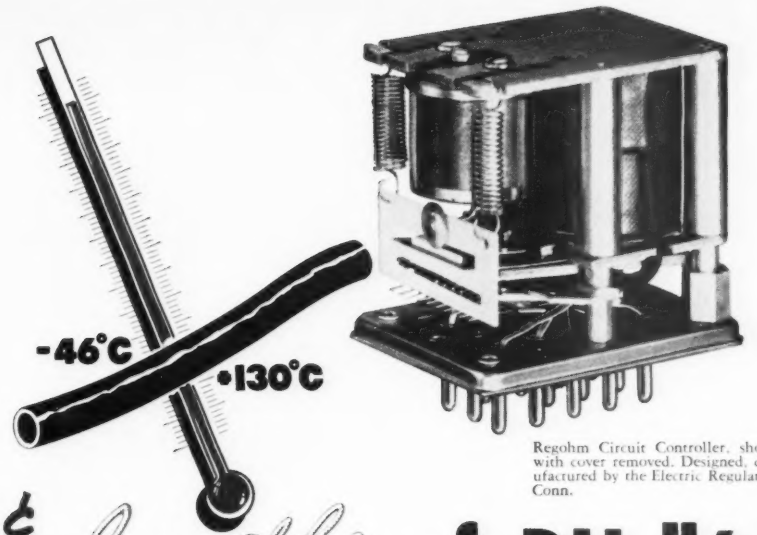
Increased industrial activity means increased load demand on power systems—but its by-product, industrial contamination, almost always comes to roost on the insulators that carry the power, and to threaten the dependability of service.

In recent years there have been increasingly frequent reports of leakage current flashovers on major substations and power lines—and of the high cost for changing out or regular cleaning of insulators.

What's the answer to this $64 question? A 25-year-old answer is in the story of Lapp Fog-Type insulator design. Lapp Fog-Type means *longer* leakage distance (on a cost per-inch-of-leakage-distance, cheaper than conventional insulators). More than that, it means a *better* leakage surface, for Lapp Fog-Types have a *uniform* leakage path without narrow shielded hot-spots—and they have a leakage surface exposed to the natural cleansing action of wind and rain.

Many companies have standardized on Lapp Fog-Type insulators for use in all areas of industrial contamination. There are units for all line and substation requirements.

Lapp Insulator Co., Inc., Le Roy, N. Y.



Regohm Circuit Controller, shown at actual size, with cover removed. Designed, developed and manufactured by the Electric Regulator Corp., Norwalk, Conn.

1/10¢ *lengths* of BH "649" ride the thermometer

Small enough to fit in the hand . . . it can control energy millions of times greater than that needed to activate it. That's the Regohm, manufactured by the Electric Regulator Corporation. It is a compact, versatile control component of the direct-acting finger type with wide acceptance as a voltage, current and speed regulator.

Electric Regulator engineers said, "We needed an insulation that would be permanently flexible through high and low temperatures. We found what we needed in BH "649" Fiberglas Tubing, and got these added advantages: BH "649" is easy to handle, it slips over wires quickly and speeds assembly time. It withstands the roughest handling without damage. It can be cut in short lengths without fraying or cracking. Its smooth, glossy surface adds to the appearance of our products."

BH "649", pioneer in the field of vinyl plastisol tubings, now offers true Class B protection at 130°C. with its improved coating formulation. Rated dielectric strength and flexibility continue after exposure to 150°C. for 300 hours, 200°C. for 20 hours, 232°C. for 3 hours—and for even longer periods if not abused after conditioning. Its resistance to chemicals and oils, as well as its high physical strength, has helped solve many tough insulation problems in a wide range of applications.

Why not investigate the advantages of BH insulations today. BH "649" is just one of a large family of Fiberglas tubings and sleevings developed specifically for the electrical industry. If you'll send facts on your requirements—voltages, temperatures, unusual conditions—we'll be happy to make recommendations and send samples for testing.

Bentley, Harris Manufacturing Co.
1111 Barclay Street
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BH FIRST IN
use of Fiberglas
heat-treated Fiberglas
true high temperature flexibility
vinyl-coated Fiberglas
silicone rubber colors in silicone rubber coating
true Class B (130°C.) protection

BH *Fiberglas** SLEEVINGS

•BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.

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Amcreco
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In an industry where so much depends on service, Amcreco offers facilities second to none. But even more important, these facilities are backed by wood preserving experience and know-how that results from nearly half-a-century's intensive study and research into wood preserving methods and problems.

Your requirements for treated materials can best be filled by an organization with the facilities and experience to provide you with efficient service and proved treatment and whose plants are strategically located for prompt domestic or export shipment. East of the Rockies, that means Amcreco. We hope to have the opportunity to quote on your needs.

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18 FIELD SALES OFFICES TO SERVE YOU

TYPICAL ANACONDA JOINTING KIT contains: lead sleeve, connector, solder, flux, paper pasters, insulating and shielding tape, filling compound, flushing compound, cotton yarn and tape, waste ends—and complete instructions. The kits are easy to order by catalog number.

ANACONDA JOINTING KITS

Here's how to make sure your stockroom doesn't overlook a *single vital item* . . . and your cable-installation crews have everything they need for a specific joint.

A single forgotten item lies on the stockroom shelf miles away. Your jointer has to stop work!

Someone grabs the wrong material in a hurry. The result is the same—wasted time and labor costs.

The remedy lies in the ANACONDA Unit Package of Jointing Material shown in the illustration above. Here in one conveniently-packaged kit is everything for one complete joint on a specific type and size of cable—impregnated-paper, varnished-cambric, rubber or thermoplastic. The kit is tailored to fit the cable perfectly.

Nothing has been left out. It's complete to a bill of materials and easy-to-follow instructions that assure a neater and better job. Every item has been laboratory- and service-proven—designed by power-cable specialists.

To keep pace with the increasing demand for ANACONDA Accessories, it has been necessary again to greatly increase the facilities of the Cable Accessories Department. This Department is now in a position to promise prompt shipment on most of your orders. Your Anaconda Representative can help you select suitable accessories from our complete line of potheads, insulating compounds, jointing kits, paints, connectors, etc. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

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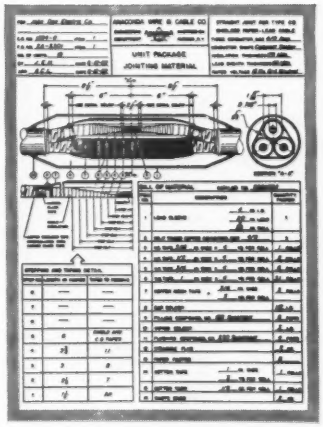


BILL OF MATERIAL and sketch with dimensions are included . . . a handy check-guide for proper jointing technique!

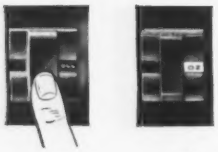
Accessories for all types and sizes of bare and insulated conductors.

ANACONDA®

BULLDOG *Pushmatic*® ELECTRI-CENTERS

Safe, Modern . . . SIMPLE

No Needless Service Calls*



When short circuits or overloads strike, Pushmatic instantly stops current. Just *push the button* and service is instantly restored (unless trouble still exists.)

Simplicity is the key to the safe, modern *thoroughbred* design of BullDog Pushmatic Electri-Centers. An Electri-Center is simple to install, simple to maintain — and most important, simple to operate.

Just push a button and service is instantly restored after a short or overload breaks the circuit. There is *no* confusing trip position. Service calls to reset breakers or to replace fuses are eliminated. Pushmatics are absolutely safe because they stay "OFF" while there's trouble on the line, even if the button is pushed or held down.

Designed for today's "Appliance-Age" homes, BullDog Electri-Centers can be installed *anywhere* in the home for extra convenience. They have spare circuits, protected by filler plates, to cover all future needs; they are available in a wide range of sizes to fit any requirement from 2 to 42 circuits.

Write today for free Bulletin PM-355 giving complete details on Pushmatic circuit breakers and Electri-Center panelboards. BullDog Electric Products Company, Dept. WD-113, Detroit 32, Michigan.

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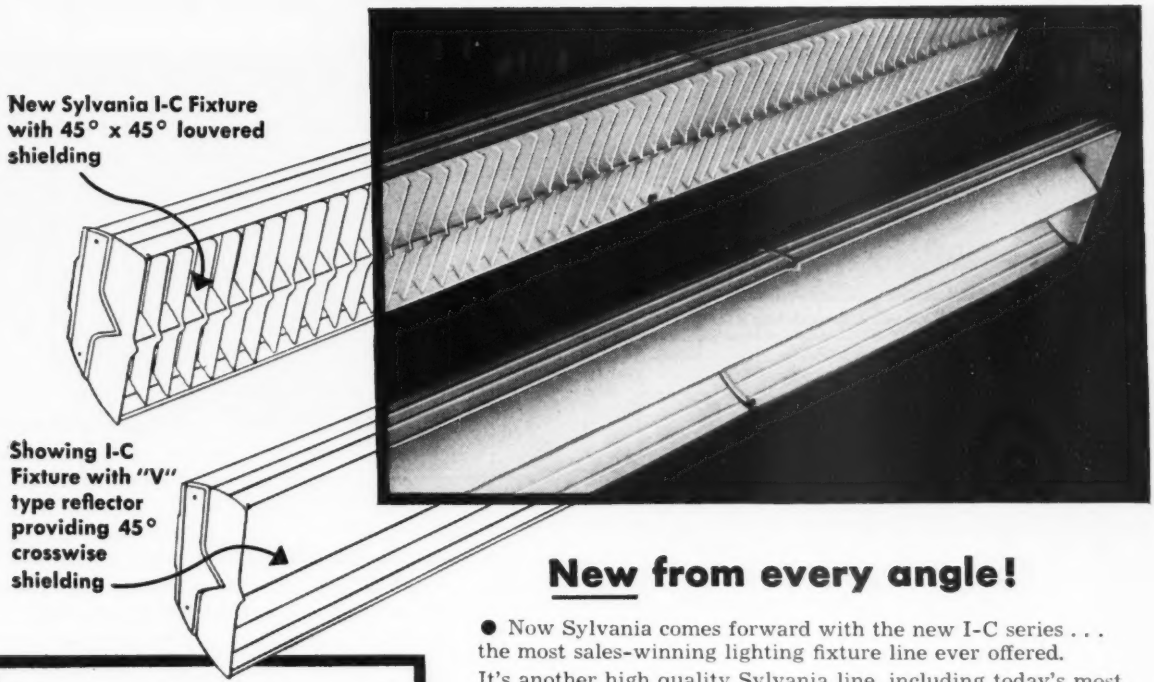
BULLDOG
ELECTRIC PRODUCTS COMPANY

Sylvania Announces! A New Industrial-Commercial Fluorescent Fixture Line!


New Sylvania I-C Fixture with 45° x 45° louvered shielding
Showing I-C Fixture with "V" type reflector providing 45° crosswise shielding

Quality built and packed with these advanced features:

45° x 45° Louvered Shielding—Direct Glare is kept to a minimum when 45° x 45° louver shielding is used.

60%-40% Distribution — Distribution from I-C fixtures is 60% downward and 40% upward, providing a strong direct component for high levels of illumination.

Versatile and rugged, too! — Channels are die-formed of 20-gauge steel. Made with extra knockouts to provide flexibility of installation. Designed for individual or continuous-row installations, pendant or surface mounting. Metal parts Bonderite treated to resist deterioration. Channels, louvers and steel panels finished in Sylvania's high-temperature baked Miracoat, providing 86% reflectivity.

T-17 Low Brightness Unit — The I-C line has been designed to accommodate the 40-watt 60-inch T-17 low-brightness lamp, meeting the need for a unit with minimum shielding. Combines low brightness, comfortable illumination with high efficiency and easy maintenance.

New from every angle!

● Now Sylvania comes forward with the new I-C series . . . the most sales-winning lighting fixture line ever offered.

It's another high quality Sylvania line, including today's most wanted features. Amazingly versatile, too, with 4, 5, and 8 foot units specifically designed to meet the lighting needs of offices, stores, schools and factories. Ideal for critical seeing tasks such as those encountered at printing plant composing stones or in the machining of specular metals.

And, it's a right-priced line offering new business opportunities to your architect, builder, and electrical-contractor friends . . . for both *industrial and commercial applications.*

Remember, this Sylvania I-C line is designed, built and tested and *fully guaranteed* for one year by Sylvania. For detailed information see your Sylvania representative or write directly to: Sylvania Electric Products Inc., Dept. 3X-2712, 1740 Broadway, New York 19, N. Y.

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University Tower Building, St. Catherine Street, Montreal, P. Q.

Multi-stop leader
ALL-WEATHER WORKSHOP ON WHEELS

INTERNATIONALS with standard style 12-foot METRO bodies, used widely for public utility field service. Short overall length saves garage and dock space.

INTERNATIONAL Trucks with METRO® bodies have been the leader in the multi-stop field for 15 straight years. They give lowest-cost performance because the rugged INTERNATIONAL chassis and the all-steel METRO body are specialized for the frequent stops required in field and repair service.

More Work Space. Every METRO body has greater load space, ranging from 243 cu. ft. for the standard back 7¾-ft. body to 392 ft. for the flatback 12-ft. body. This transformer service truck is an example of the scores of adaptations of the METRO body in use by public utilities.

Maximum maneuverability from short wheelbase. Forward position of driver commands view of traffic. Driver uses fully insulated, roomy engine cover for extra work space.

Low Stepwells. Driver time and energy are saved by low stepwells and many other exclusive features. Inside step is only 8 inches high, average for household stairs.

6-foot headroom. There is a full 6-foot headroom in the load space of METRO bodies. This new feature adds to serviceman's efficiency. Sliding front doors are standard, folding doors optional.

New driver comfort. Exclusive bucket-type seat, specially designed to make driver's work easier, cushions the driver in foam rubber comfort. Folding steel back. Adjustable seat folds and swings forward.

Get the long life and low operating cost of the INTERNATIONAL chassis, the unusually low maintenance cost of the METRO body. Compare INTERNATIONAL with any other service truck.

More payload space. Eight body sizes, two body styles—standard or flatback. Four body lengths—7¾, 9½, 10½, and 12-ft.; *each* has increased capacity. New capacities range from 243 to 392 cu. ft.

New driver convenience. New full 6-foot headroom. Low stepwells. Sliding front doors standard, folding doors optional. Six rear door options.

New driver comfort. New broadleaf springs. New shock absorbers. Lower center of gravity. New toeboard angle.

New savings. New downdraft carburetion for greater fuel economy. New cushioned disc clutch for longer life, smoother operation.

Six chassis models, 102, 115, 122, and 134-inch wheelbases. GVW ratings, 5,400 to 11,000 lbs.

Ask your INTERNATIONAL Dealer or Branch for a demonstration. Time payments arranged.

INTERNATIONAL HARVESTER COMPANY · CHICAGO

International Harvester Builds **McCORMICK®** Farm Equipment and **FARMALL®** Tractors . . . Motor Trucks . . . Industrial Power . . . Refrigerators and Freezers

Better roads mean a better America

INTERNATIONAL® TRUCKS

"Standard of the Highway"

25% More CLAMPING FORCE!

Amazing CFC* Process Sets Impressive New Standards for Connector Performance

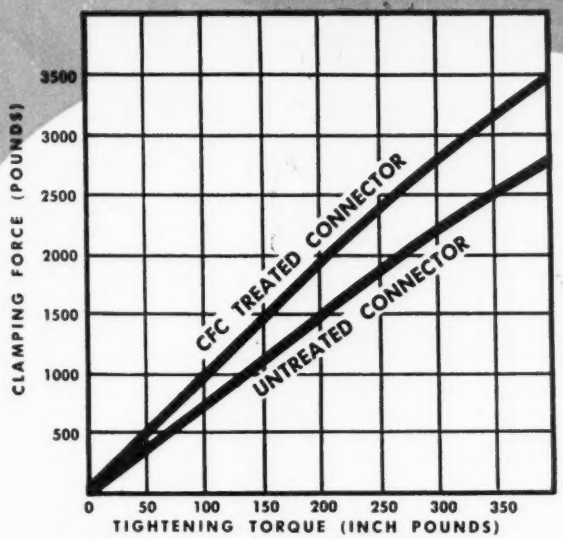


Fig. 1: *Clamping force vs. tightening torque for No. 2 stranded connectors, comparing CFC treated connectors with untreated connectors of the same lot.*

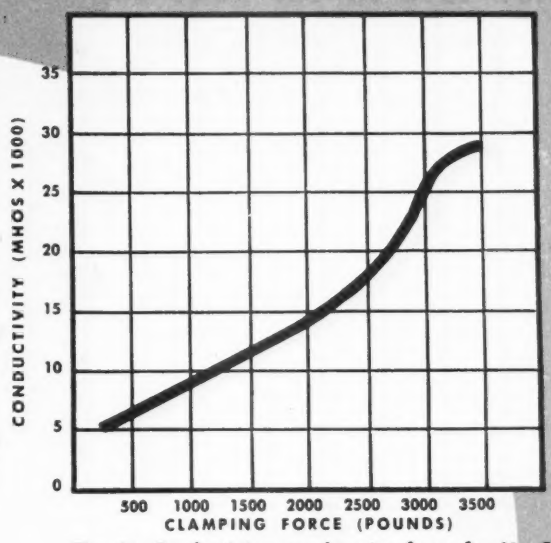
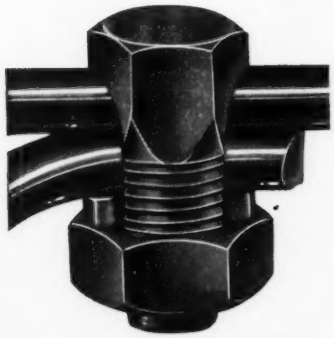


Fig. 2: *Conductivity vs. clamping force for No. 2 stranded hard drawn conductors.*



BLACKBURN'S exclusive chemical process for copper alloy connectors drastically reduces thread friction — increases clamping force — produces lower-resistance connections — and insures lasting, trouble-free service.

The above graphs show the great advantages of CFC treated Connectors. Note over 25% increase in clamping force. Note also how clamping force greatly increases conductivity of the connection. Thus, high clamping force, plus connector strength to **maintain** this force, gives you the **ideal** connection.

BLACKBURN Hi-Strength Connectors give you this **extra** clamping force — give you the **extra** strength to **hold** a maximum-pressure connection . . . Result — absolutely dependable connections that stay tight and trouble-free year after year.

Chemical Friction Control Process—Patent pending

JASPER BLACKBURN CORP.
35 MADISON ST., ST. LOUIS 6, MO.
Phone CEntral 3007

BLACKBURN *Hi-Strength* CONNECTORS

Announcing the new

Westinghouse "DX" Cutout

the simplest, most rugged open cutout ever built

One look tells the whole story of this new cutout. The massiveness of the parts . . . the simplicity of design tell you instantly that here are strength and reliability never available before in open fuse cutouts. One look and you *know* that this cutout will stand up under years of weather and rough handling . . . will boost your system reliability and cut operating and maintenance costs.

Here's why the Westinghouse DX Cutout is so *simple:*

No complicated mechanism—no extra gadgets—nothing to go wrong in closing, opening, or re-fusing. When a fuse blows, the simple toggle mechanism provides fast, positive dropout.

Open construction allows fast, safe removal of the fuseholder. Brightly painted fuseholders aid in swift identification of blown fuses.

Unique hinge design insures easy replacement of the fuseholder. Linemen can throw it in from any angle—the top and bottom contacts will always align perfectly.

Here's why the Westinghouse DX Cutout is so *rugged:*

Metal parts are clamped—not cemented—to porcelain. There are no recesses or reduced sections in the porcelain insulator, assuring maximum strength. It's bird-proofed, too—clamping bands are covered with 15,000-volt polyethylene insulation.

Extra-large sleet shields completely protect both top and bottom contacts. Your sleet troubles are over.

Large-area contacts maintain good contact pressure for years. Both moving and stationary contacts are silver-plated.

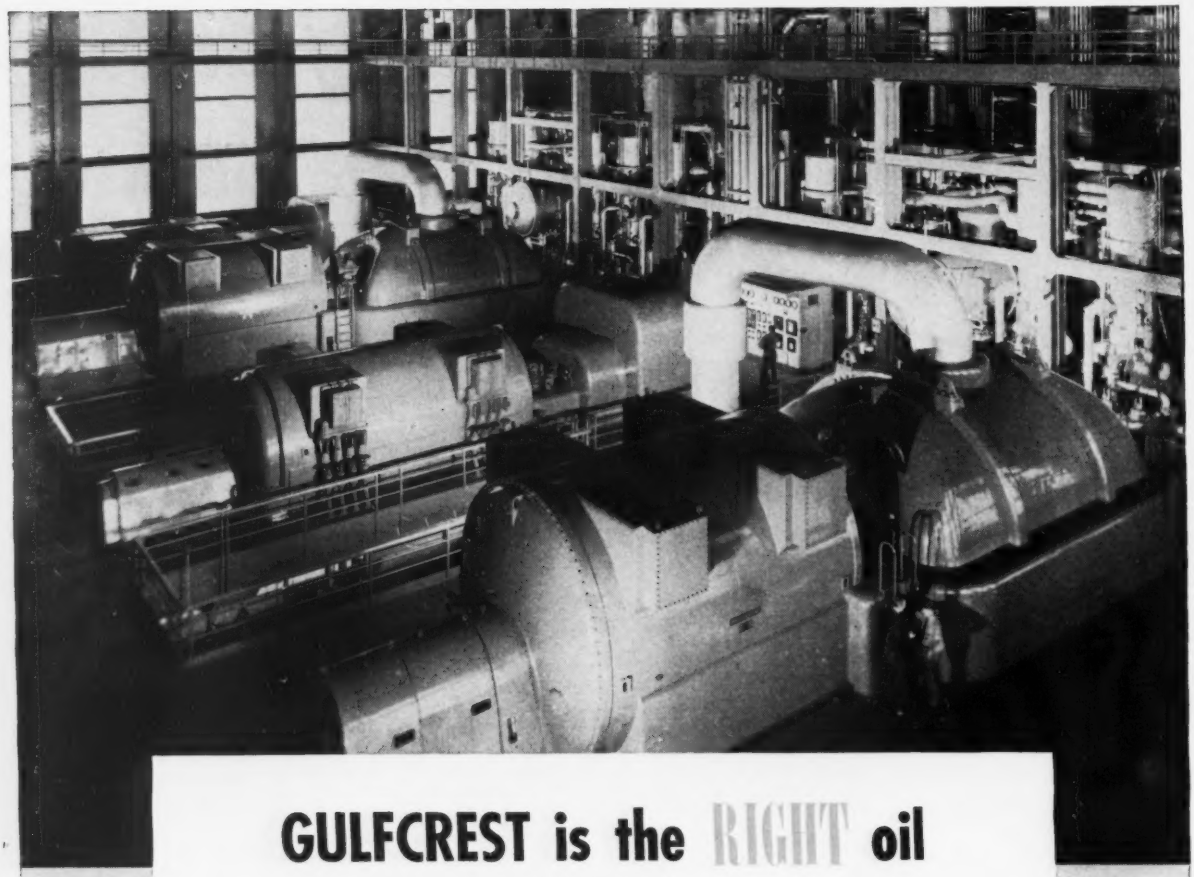
AVAILABLE NOW

The new Westinghouse DX is the cutout you need to get the performance you've always wanted. And they are *available now!* Ratings: 5.2, 7.8 and 15-kv interrupting capacity, 2000 to 5000 amperes. Contact your Westinghouse Representative for full particulars, and write for DB 38-620, Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60855

YOU CAN BE **SURE**... IF IT'S

Westinghouse

Typical of the outstanding steam turbine generators lubricated with Gulfcrest Oil are these two 168,750 kw. Westinghouse Cross-Compound turbines at the Southwark Electric Generating Station of the Philadelphia Electric Company.



GULFCREST is the RIGHT oil for every steam turbine

the RIGHT base stock, Alchlor-processed

the RIGHT combination and concentration of additives

the RIGHT background of performance

Gulfcrest Oil has a background of successful performance in every type and make of steam turbo-generator.

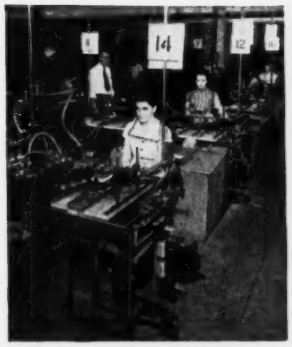
In many of these installations the original charge of Gulfcrest has been in service more than 10 years with no significant change in its original characteristics, and with neutralization numbers always remarkably low and safe.

To get this kind of lubrication for your turbine, call in a Gulf Sales Engineer and ask him to recommend the proper grade of this superior oil. Write, wire, or phone your nearest Gulf office today.

Gulf Oil Corporation · Gulf Refining Company

Pittsburgh 30, Pennsylvania

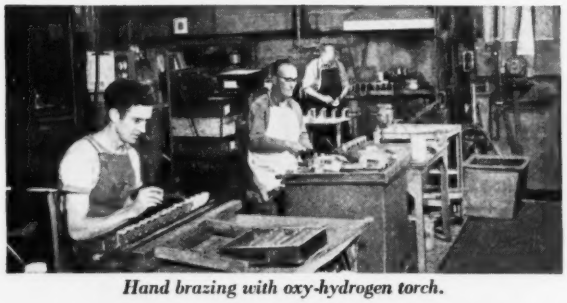
GULF SERVES INDUSTRY



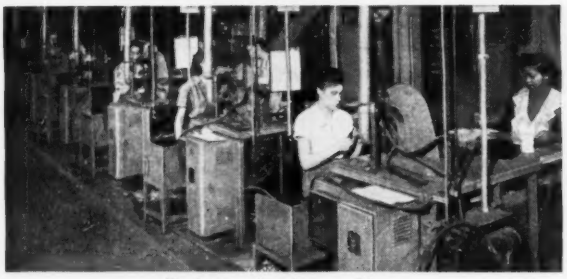
Gas brazing equipment.

Induction brazing unit.

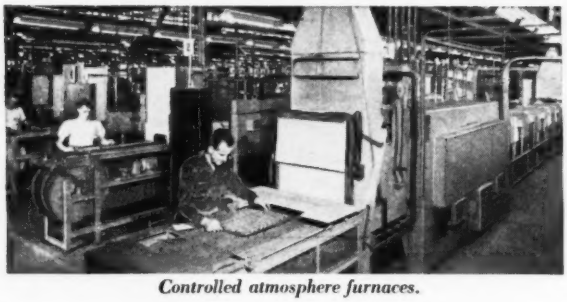
STOP
YOUR CONTACT TROUBLES
BEFORE THEY START



Hand brazing with oxy-hydrogen torch.



Resistance brazing machines.



Controlled atmosphere furnaces.

Not One...But Five!

All five types of brazing equipment are available at Mallory to meet your particular needs.

On even the simplest button or rivet contact, trouble can start with the wrong method of bonding. Size, shape, nature of the material, frequency and degree of impact, tooling costs and production quantities . . . all must be considered in selecting the one best method of brazing.

Mallory is equipped to make completely unbiased decisions in selecting the best and most economical brazing technique for any type of contact or contact assembly. Our plant is equipped with all five types of brazing equipment . . . as well as four types of resistance welding equipment. Facilities are available in the laboratory as well as on the production floor. Production techniques are worked out ahead of time . . . before production runs are started . . . so you can be sure of completely dependable contacts, economically produced.

This is only part of the story, however. If you want the rest of it, our engineers will be glad to send you complete information . . . or answer any questions you may have regarding the design and production of the contacts for your products.

Expect more...
Get more from MALLORY

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario

Electrical Contacts and Contact Assemblies

P.R. MALLORY & CO. Inc.
MALLORY

SERVING INDUSTRY WITH THESE PRODUCTS:
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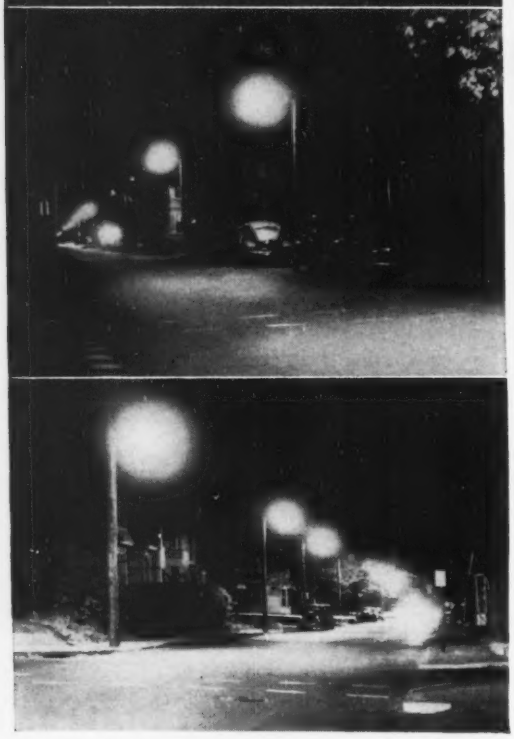
NOW...

TRANSFORM DARK DANGEROUS STREETS INTO SAFE WELL-LIGHTED HIGHWAYS!



Typical installation system of Brockton Edison Co. Brockton, Mass.

Wheeler CRESCENT REFLECTOR

The only inexpensive open reflector that combines *all* these "better street lighting" features:

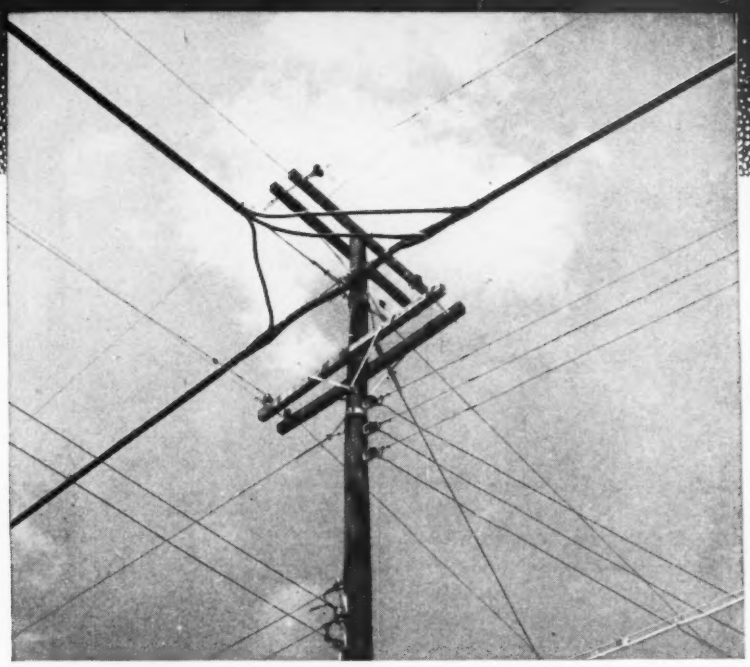
1. **longer spacings possible without dark pavement between units**
2. **glare from exposed filament reduced to conventional limits by Wheeler's exclusive Edgeflector**
3. **floating screw neck for accurate light direction**
4. **long-life construction for low-cost maintenance**

Write for facts and figures!

Wheeler STREET LIGHTING

SPECIALISTS IN SKILLED LIGHTING SINCE 1881
275 CONGRESS ST. — BOSTON, MASS.

DO YOUR OVERHEAD LINES LOOK LIKE THIS?



This photograph shows many of the reasons why you should consider installing aerial cable instead of line wire. Notice what a neat, compact job the linemen have done and how unobtrusively the cable fits into the picture. Wouldn't you like your overhead lines to look like this?

It is a safe job too because the cable is completely insulated. Even if the cable should fall, which is highly unlikely, there is little or no danger to passers-by. Experience has shown that insulated aerial cable is the safest form of above ground transmission. Wouldn't you like that?

Notice how flexible the installation is too. See what a good looking "Y" tap has been taken off and notice the streamlined appearance of the splices. There is little danger here from swinging arcs or grounds caused by wet conditions. This type of an installation will reduce your trouble calls from owners of television sets. Wouldn't you like to increase safety and cut down on customer complaints?

Insulated aerial cable leaves the pole in an uncluttered state. Wouldn't you like to leave the impression with your customers that you practice good housekeeping?

These advantages and more can be yours if you use Simplex Aerial Cables. You will find that they are exactly what you want. They are made in various styles and sizes to meet varying conditions. Want more information about these versatile distribution lines? A note to the address below will bring it to you without obligation.

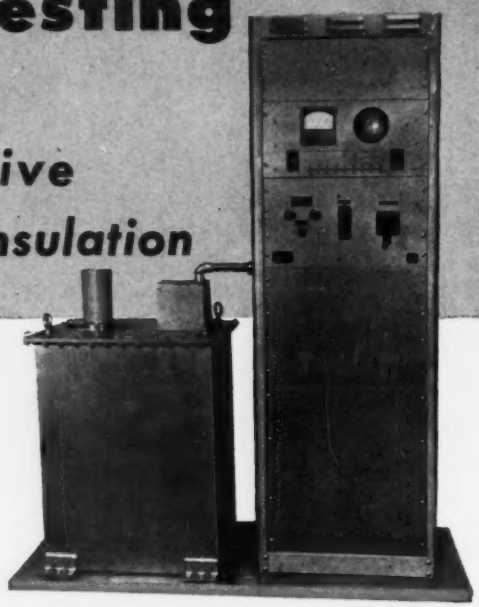
Simplex - WIRES & CABLES

SIMPLEX WIRE & CABLE CO.
79 SIDNEY STREET,
CAMBRIDGE 39, MASS.,

BIDDLE Corona Testing Equipment

...for non-destructive evaluation of electrical insulation

Model 1, .75 KVA, 20 KV continuously or 1.5 KVA for intermittent duty. Also available with a larger control unit with a rating of 2 KVA continuous and 5 KVA intermittent duty.



Model 2, rated up to 10 KVA, 35 KV continuously or 20 KVA intermittent duty.

Safety, Simplicity, and Reliability have been engineered into Biddle Corona Test Sets to such a degree that operation by engineering personnel is not required. The facility and efficiency of these sets in the hands of average individuals makes them highly practical. Our wide experience in the field of insulation testing and the development of practical, easy-to-use equipment for this purpose is reflected in these Corona Test Sets. Experience indicates that the life of cable, transformers, motors, generators, and other such equipment may be shortened by operation at voltages substantially higher than the corona or ionization starting voltage. It is a known fact that the corona starting voltage is not always constant but may decrease with aging.

With the Biddle Corona Test Set non-destructive evaluation of insulation by corona testing is now practical as a production control of quality of insulating structures.

Biddle Corona Test Sets consist of a control unit, a detector unit, and a high voltage corona-free testing transformer which incorporates means for picking up corona signals from the equipment under test. The frame of such equipment may be grounded. This is a "must" for practical testing.

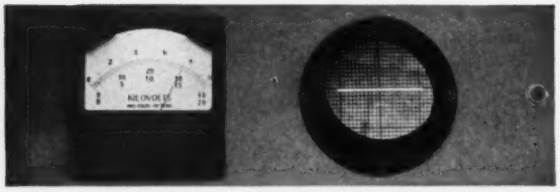


Figure 1—Showing the detector panel indicating a voltage just below the corona starting voltage on a typical sample.

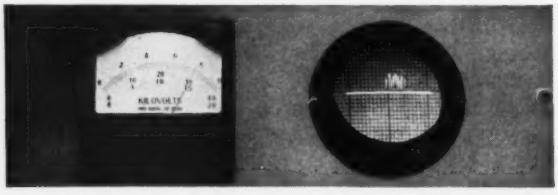


Figure 2—Showing the detector panel after increasing the voltage above the corona threshold.

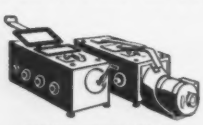
In operation, the equipment to be tested is connected to the high voltage terminal of the testing transformer, and 60 cycle test voltage is increased until corona indication appears on the cathode ray tube in the detector unit. The rms equivalent of peak voltage is then read from the adjacent peak voltmeter.

Write for **BULLETIN 66-W**

B-877

JAMES G. BIDDLE CO.

Electrical & Scientific Instruments • 1316 Arch Street • Philadelphia 7, Pennsylvania

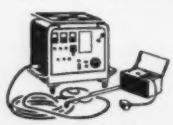


MEGGER INSULATION RESISTANCE TESTERS

DUCTER LOW RESISTANCE OHMMETER

MEG-TYPE MEGGER INSULATION TESTER

MIDGET MEGGER CIRCUIT TESTING OHMMETER

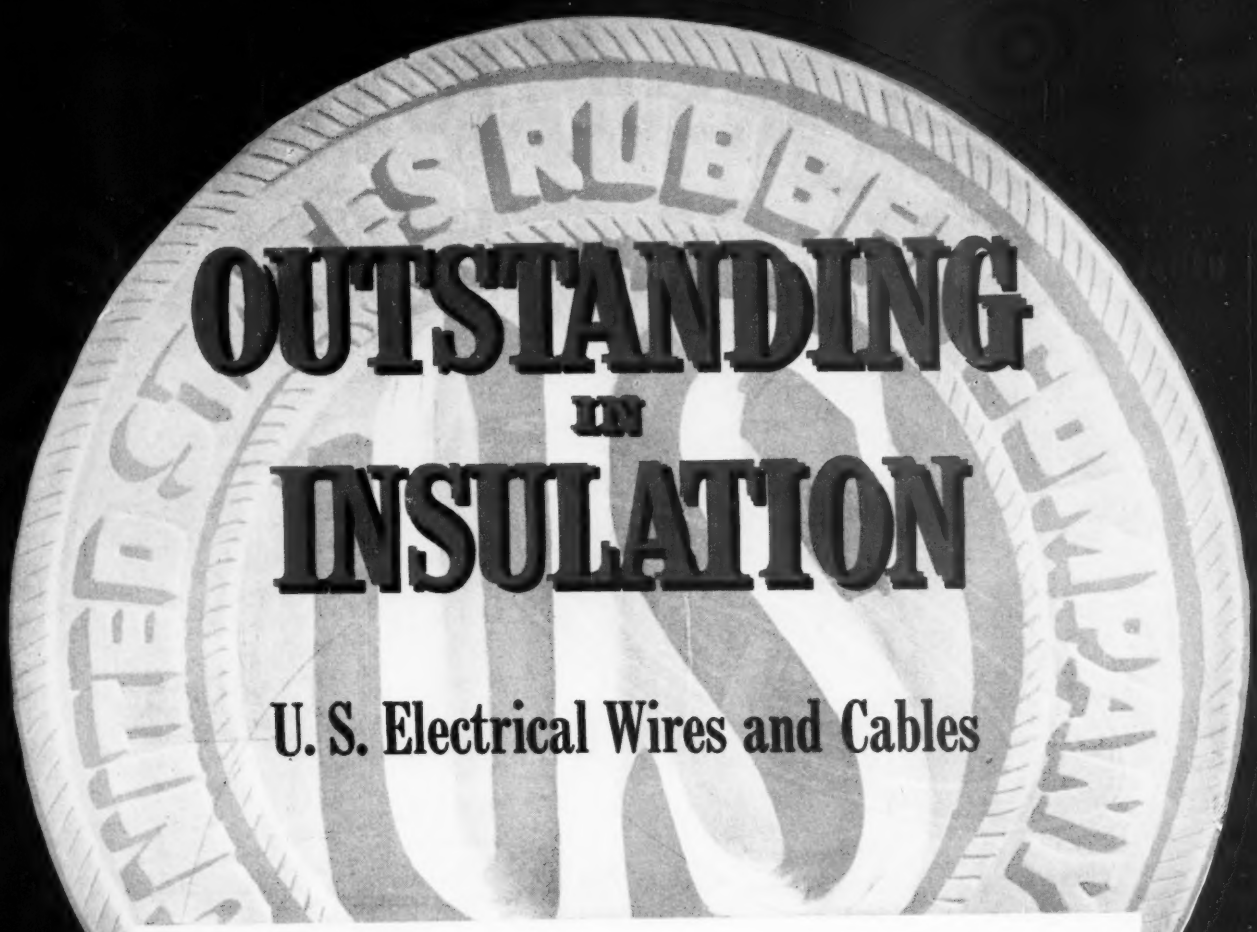


BIDDLE IMPULSE CABLE FAULT LOCATOR

MEGGER LOW RESISTANCE OHMMETER

"TTR" TRANSFORMER TURN RATIO TEST SET

UNITED STATES RUBBER COMPANY



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U. S. Electrical Wires and Cables

LAYTEX® RUH-RUW—The world's smallest diameter, lightest weight natural rubber-covered power and lighting wire.

NEOLAY® RU—With Laytex Insulation plus Neoprene. Nylon cover makes pulling five times easier.

CONTROL CABLE—Insulated with Laytex for greater circuit integrity.

NEOPRENE COVERED SERVICE ENTRANCE CABLE—Flame retardant, moisture resistant—the first ever accepted by Underwriters' Laboratories, Inc.

MUNICIPAL SIGNAL CABLES—Insulated with Laytex for maximum moisture resistance.

POWER CABLES—Of every description, including the famous Grizzly® line of tough cables.

ALUMINUM WIRES AND CABLES—U. S. Rubber introduced insulated aluminum conductors.

ELECTRIX® PLUGS—U. S. Rubber was a pioneer in the development of soft rubber plugs for extension cord sets and power supply cords. (Also all rubber cube taps.)

ROYAL PORTABLE CORDS AND CABLES—And many other types of electrical wires and cables.

ROYAL MINING MACHINE & LOCOMOTIVE CABLES—Tested many different ways to insure complete dependability.

INTERCOMMUNICATION CABLE—With thermoplastic insulation and jacket making this cable flameproof throughout.

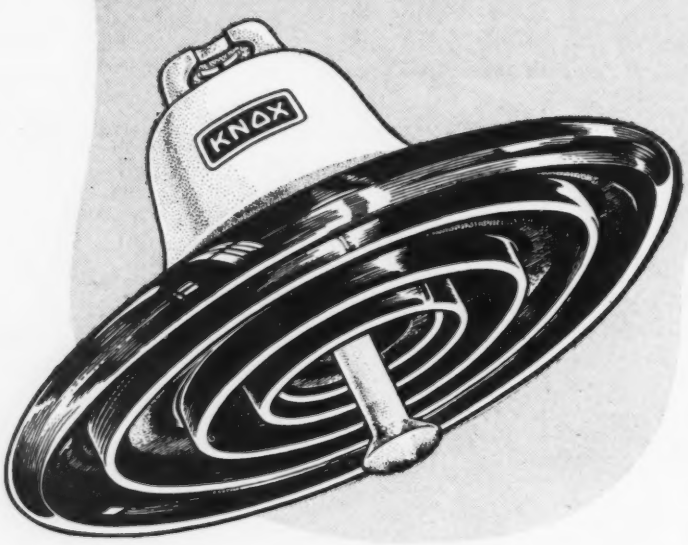
TWISTED SERVICE DROP CABLE—Either neoprene insulated or performance insulation and neoprene jacket; copper or aluminum conductors.

UNITED STATES RUBBER COMPANY · ELECTRICAL WIRE & CABLE DEPARTMENT

1230 Avenue of the Americas · Rockefeller Center, New York 20, N. Y.

KNOX INSULATORS

give you extra protection



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When you build high voltage lines with KNOX Insulators you get extra protection during installation and service because KNOX Insulators are ruggedly built to withstand severe installation impacts as well as the most unfavorable weather conditions. KNOX Insulators and Hi Line Hardware are quality made and rigidly inspected to meet laboratory tests and specification. Our ample stocks insure PROMPT delivery.

KNOX

KNOX PORCELAIN CORP.

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Duke Power Company
Eastern Shores Public Service Company
Fitchburg Gas & Electric Light Company
Florida Power Corporation
Florida Power & Light Company
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Iowa Public Service Company
Iowa-Illinois Gas & Electric Company
Iowa Power & Light Company
Iowa Electric Light & Power Company
Kansas City Power & Light Company
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Long Island Lighting Company
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Louisiana Power & Light Company
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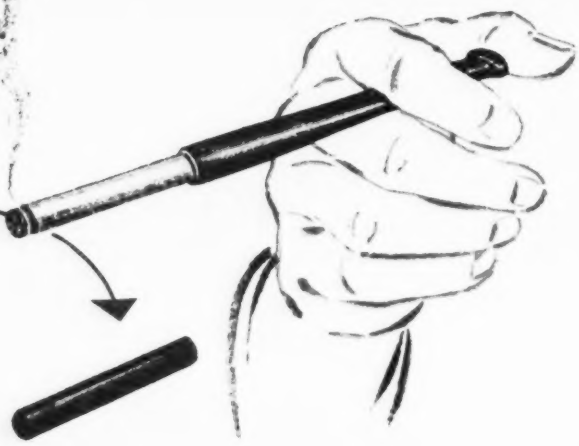
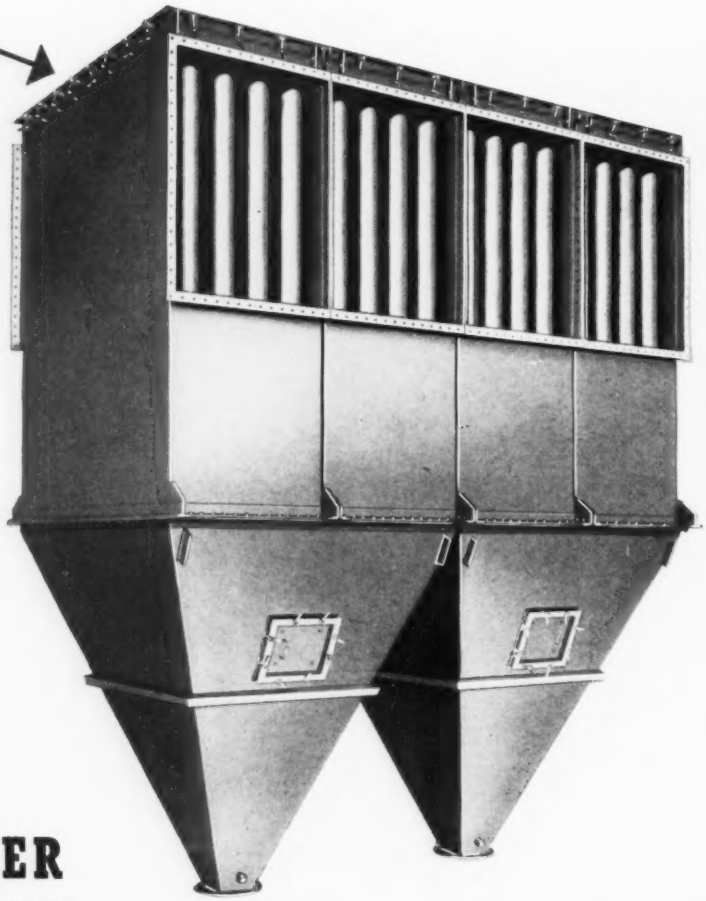
Philadelphia Electric Company
Potomac Electric Power Company
Public Service Company of Oklahoma
Public Service Electric & Gas Company
Public Service Company of Colorado
Southwestern Public Service Company
Southern Indiana Gas & Electric Company
South Carolina Electric & Gas Company
Springfield, Illinois, City of
Tampa Electric Company
Texas Electric Service Company
Texas Power & Light Company
Tennessee Valley Authority
Virginia Electric & Power Company
Worcester County Electric Company of Massachusetts
AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary corporation

American Blower . . . a time-honored name in air handling



This filter collects the residue from a burning cigarette

This American Blower Fly Ash Precipitator collects fly ash from boilers burning solid fuels.



Install an American Blower Fly Ash Precipitator in your power plant— and see the difference.

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

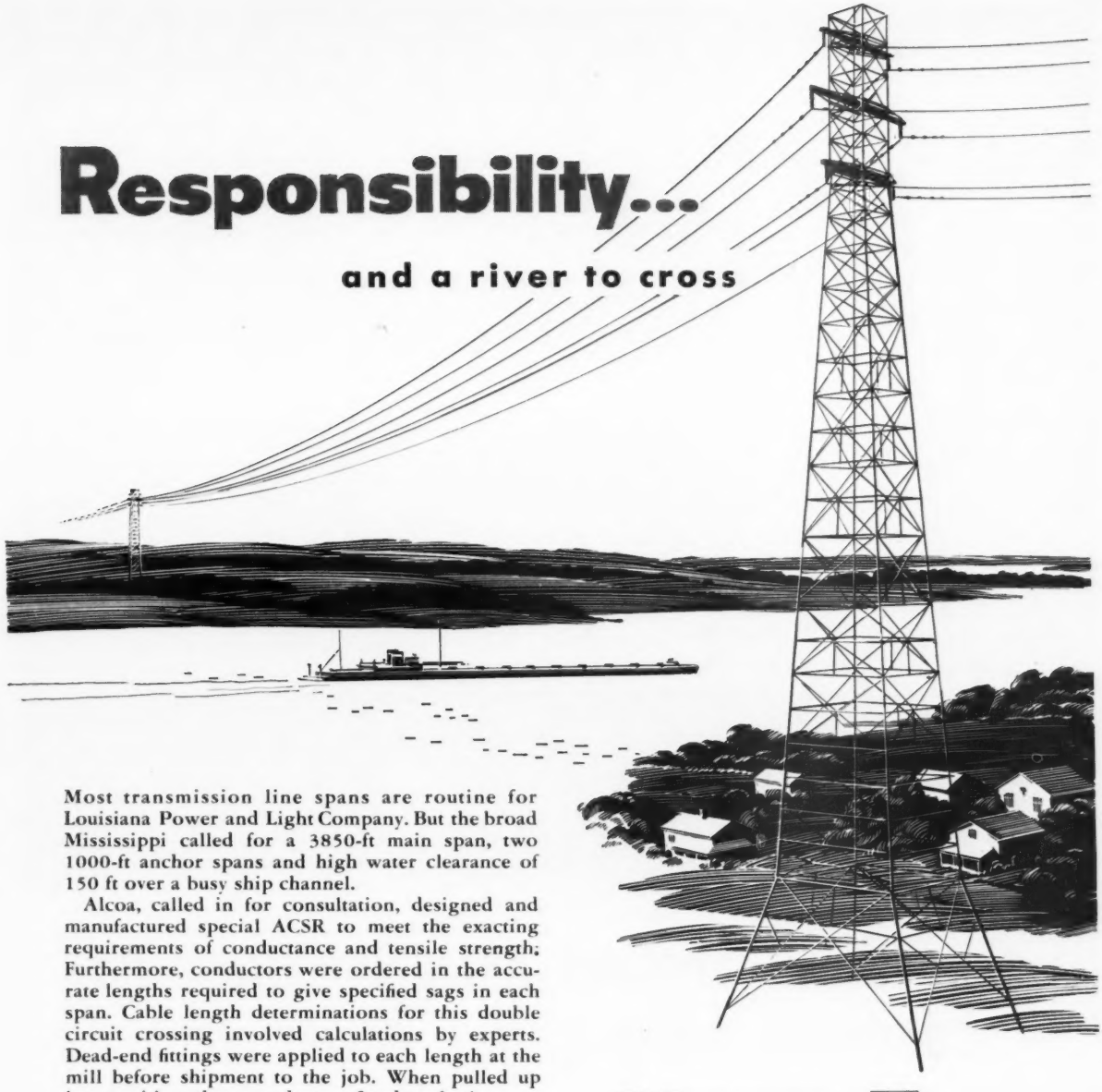
Division of American Radiator & Standard Sanitary corporation

Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · CHURCH SEATS & WALL TILE · DETROIT CONTROLS · KEWANEE BOILERS · ROSS EXCHANGERS

Responsibility...

and a river to cross



Most transmission line spans are routine for Louisiana Power and Light Company. But the broad Mississippi called for a 3850-ft main span, two 1000-ft anchor spans and high water clearance of 150 ft over a busy ship channel.

Alcoa, called in for consultation, designed and manufactured special ACSR to meet the exacting requirements of conductance and tensile strength. Furthermore, conductors were ordered in the accurate lengths required to give specified sags in each span. Cable length determinations for this double circuit crossing involved calculations by experts. Dead-end fittings were applied to each length at the mill before shipment to the job. When pulled up into position, these conductors fitted perfectly.

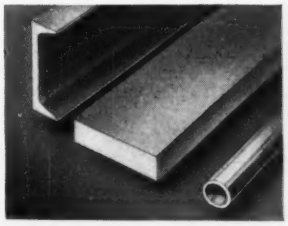
Unusual service? Not for Alcoa. We co-operate readily because we believe that the best installations are just as important as the best products. This is your guarantee of satisfaction with Alcoa® Aluminum Electrical Conductors. Aluminum Company of America, 2100-Y Alcoa Building, Pittsburgh 19, Pa.

Alcoa Aluminum

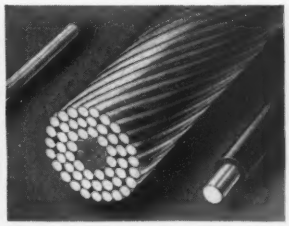
ALUMINUM COMPANY OF AMERICA

Alcoa brings the world to your armchair with "SEE IT NOW" featuring Edward R. Murrow, Tuesday evenings on most CBS-TV stations.

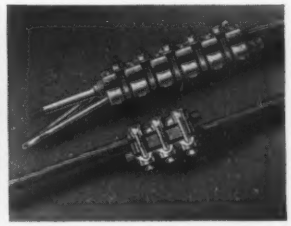
Alcoa Aluminum Bus is available in rectangular and solid round bars, channels and tubular shapes.

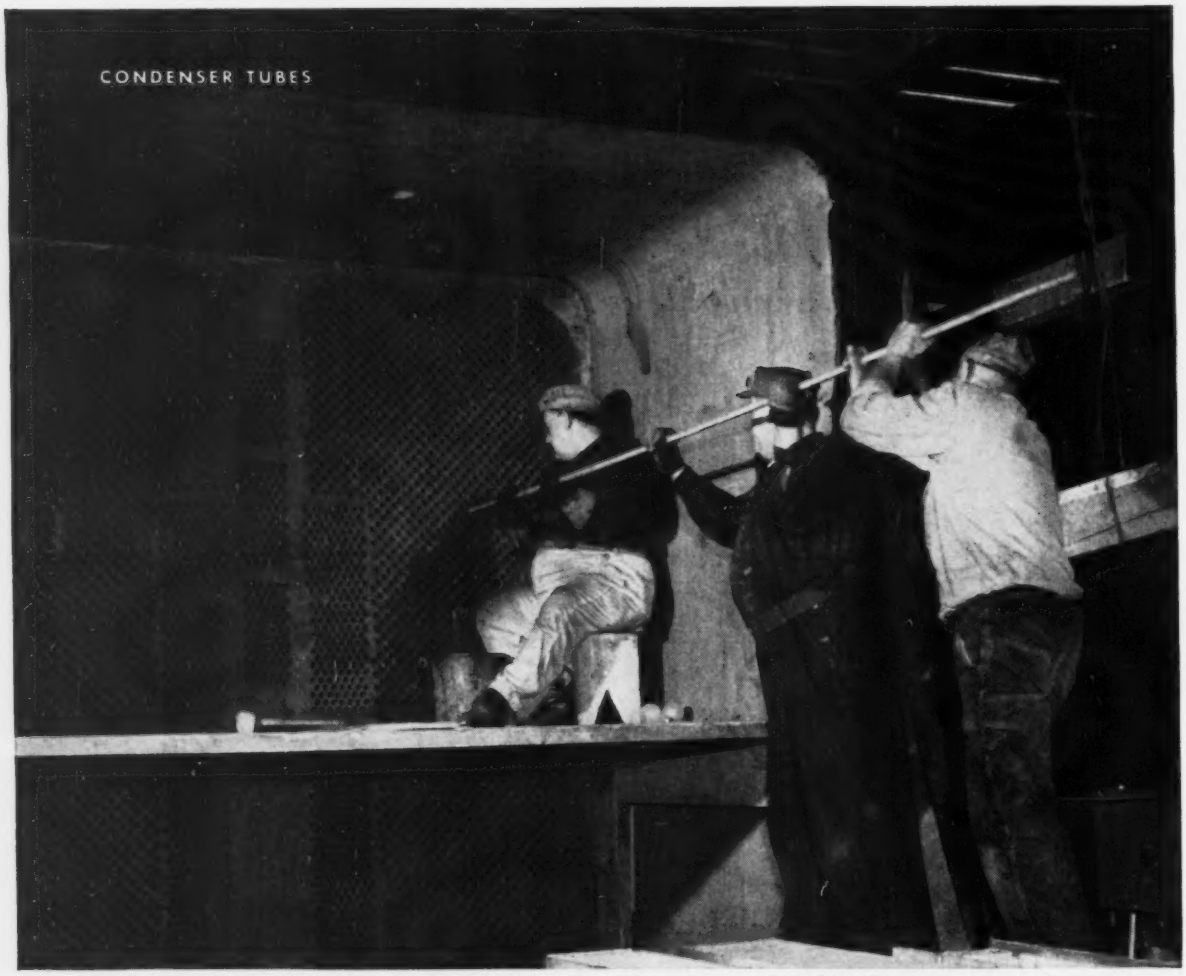


Alcoa Aluminum Electrical Conductors include ACSR, solid and stranded aluminum wire, bare or covered.



Alcoa's full line of aluminum accessories is correctly designed for use with all aluminum conductors.

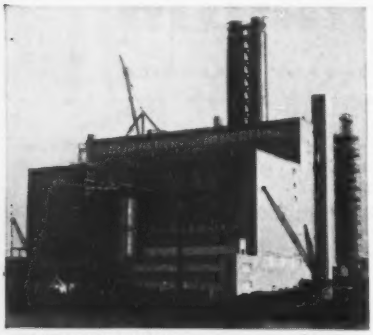




HERE'S ONE of more than 6260 ANACONDA Ambraloy-927* Tubes going into Consolidated Edison's new condenser.

Con Edison chooses Aluminum Brass for condenser tubes in new power plant

The Consolidated Edison Company's new power plant in Astoria, N. Y., will house 6 generating units. Unit #2, having a 160,000-kw generator, will be put on the line in the Spring of 1954. The condenser serving this unit has cooling surface area of 105,000 sq. ft. Tubes—15,450 of them—are Aluminum Brass, ⅞" O.D., #18BWG, 30 ft. long. About half were supplied by Anaconda.



LOCATED IN ASTORIA, QUEENS, on the East River, Con Edison's new plant will mean better-than-ever electrical service for New York City.

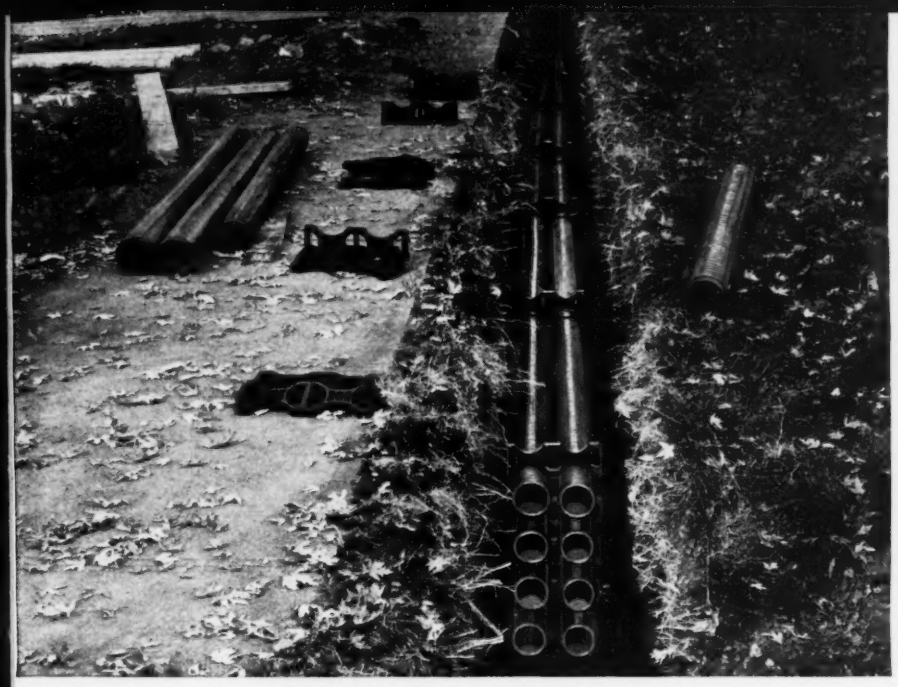
ANACONDA Ambraloy-927* (aluminum brass) is one of the most durable tube alloys available at a moderate cost. It gives excellent service in both clean and polluted sea water and has largely replaced Admiralty along the U. S. seacoast. It is used not only in main condensers, but also in auxiliary coolers for lubricating oil, transformer oil, hydrogen and air.

Anaconda supplies Con Edison — which insists upon the best equipment available — with condenser tubes and tube sheets for many of their power plants. Whatever alloy best fits *your* operating needs, choose it from the extensive line of ANACONDA Alloys for tube and tube sheets. Our Technical Department will be glad to analyze your tube performance problems at no cost. Free Publication B-2, "ANACONDA Tubes and Plates for Condensers and Heat Exchangers," will be sent on request. Write: *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.* 53112

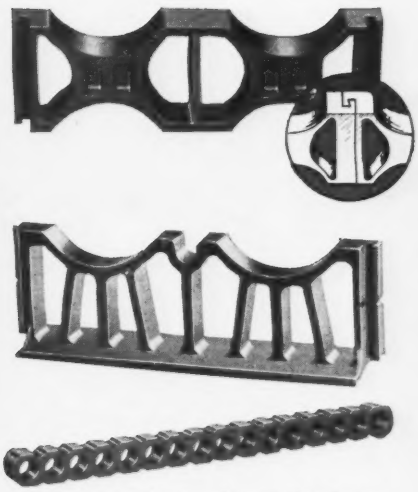
*U.S. Patent No. 2,003,685 (ORIG.)

ANACONDA®

Tubes and plates for condensers and heat exchangers • welding rods • American Flexible Metal Hose and Tubing • American Vibration Eliminators



It is easy to construct a solid, well-aligned installation with L-M Fibre Conduit and "Easy-To-Use" accessories. The illustration shows use of L-M base and intermediate spacers, to assure firm, even spacing.



L-M Spacer units. Top, Intermediate Spacer, with inset showing how spacers are locked together to make 3- or 4-way combinations. Center, L-M's Base Spacer, with 3" base to give a rigid, firm foundation. Center groove is for grounding wire. Bottom: Bend Spacer Bar, used vertically or horizontally to maintain alignment at bends. 1½"square, 20" long.

L-M's Completely Engineered System Makes Fibre Conduit So Easy To Use

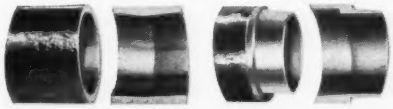
L-M Fibre Conduit has many advantages for underground installations. It's proof against corrosion, vermin, leakage; joints are easily made, without cement, and are watertight. L-M Fibre Conduit's smooth inner bore makes cable easier to pull, with minimum abrasion. You'll find it can be laid faster than many other types of duct.

In addition, L-M offers a completely engineered system for conduit installations. This includes L-M spacers, to keep installations rigid and evenly aligned; a variety of bends and fittings, including L-M's 5° couplings and 5° multi-use bend sections; the new L-M tapering tool and fibre conduit vise. Some of the L-M engineered fibre conduit fittings are shown here.

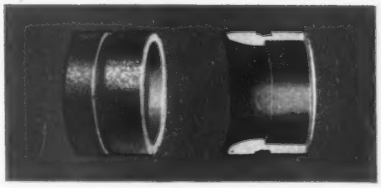
Get Complete Information

You should have the whole story. Ask the L-M Field Engineer for a copy of the 12-point plan folder, which shows how easy it is to use the L-M system; also for our underground construction handbook and Bulletin UG-1A, which gives complete specifications. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

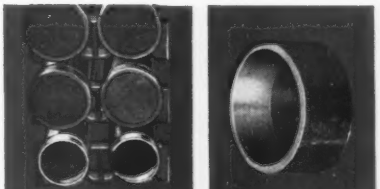
L-M provides a variety of bends. At left, 45° and 90° bends. Right, L-M's S-Bend, which provides a 20" offset without restricting drawing of cable. Special bends available on order.



The 5° angle coupling at left provides for long radius turns, and offsets. The multi-use bend section gives a 5° angle and the sections can be joined without nipples for special radius turns, crossovers, etc.



L-M's Bell Ends for use at conduit terminals in manholes provide a smoothly rounded opening that will not cut or mar the cable sheath.



L-M's Fibre Caps are accurately tapered to provide a watertight, vermin-proof seal for fibre conduit lines prior to drawing cable. Easy to remove for re-use.

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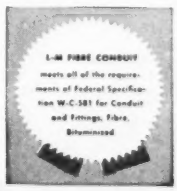

L-M FIBRE CONDUIT
meets all of the requirements of Federal Specification W-C-581 for Conduit and Fittings, Fibre, Bituminized

LINE MATERIAL

Fibre Conduit

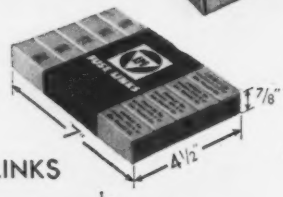
L-M's Outstanding Packaging System for EEI-NEMA Fuse Links

Provides sturdy protection for the links and convenience in warehousing, distribution, and handling.

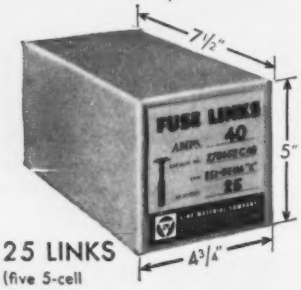
1. (Left) **Tear Off Cell:** The perforated tape makes it easy to remove one link at a time from the 5-cell carton, without exposing other links.

2. (Below) **Break Open:** The end of the cell is perforated. The link comes out of the cell in the lineman's hand. The complete job, from carton to cutout, can be done with gloved hands.

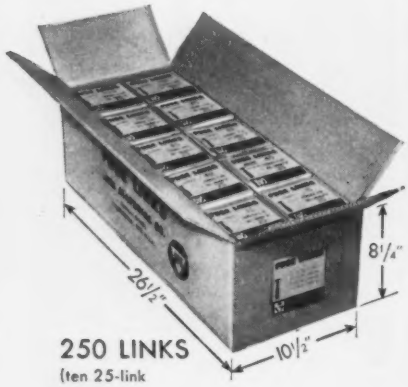
L-M's EEI-NEMA Fuse Links Conveniently Packaged



5 LINKS



25 LINKS
(five 5-cell cartons)



250 LINKS
(ten 25-link cartons)

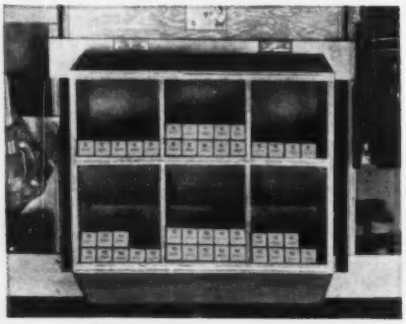
Every cell, carton, and case is clearly marked with rating, and EEI-NEMA-Standard type (K or T). Rating and type are also clearly stamped on top of link button.

L-M provides an outstanding packaging system for its new EEI-NEMA-Standard and "N" rated fuse links.

Links are in individual 5-cell perforated containers (3-cell for links above 100 amperes). One cell at a time can be torn off and the link used without exposing other links.

Five of these 5-cell containers come in a 25-link carton. These, in turn, are packed 10 to a large 250-link case. All cases, cartons and cells are individually labeled, in large type, with quantity, rating, and link *type*.

This system provides for convenient shipping, storage, and distribution—in the warehouse and on the truck. Large cartons can be stored in the main warehouse. Branch warehouses can be supplied with the 25-link cartons. Five-cell containers can be carried in racks on the truck.



Convenient for storage in racks in line trucks. Ampere ratings shown in large type on both ends of cartons.

Free Handy Fuse Link Curve Sheet Packet and Bulletin on New EEI-NEMA Links

Ask the L-M Field Engineer for a copy of Bulletin FC5A, with full information on ratings and coordination of L-M's new EEI-NEMA-Standard fuse links. If you'd like it, he'll give you one of L-M's handy fuse link curve sheet packets with curves on EEI-NEMA and L-M Hi-Surge links. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

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LINE MATERIAL
fuse cutouts and fuse links

Wide Acceptance Shows Need For L-M Heavy Duty Cutouts

L-M's "PHD" (Porcelain Heavy Duty) Fuse Cutouts have met with wide acceptance all over the country. This shows the need that exists for a complete line of cutouts designed and built especially for service on high capacity distribution feeders.

5 kv

50 amperes
8000 amperes
interrupting capacity

100 amperes
14,000 amperes
interrupting capacity

200 amperes
20,000 amperes
interrupting capacity

L-M's "PHD" Cutouts, introduced more than two years ago, comprised the first complete line of heavy duty cutouts with realistic and usable interrupting capacities. Extensive testing was conducted for two years before they were introduced. Special attention was paid to design details, such as cementing, contact alignment, and door and cartridge positioning, which govern successful cutout operation. These cutouts successfully clear both high and low amperage faults—safely, without danger of exploding porcelain—and assure safety for personnel and equipment, and continuity of service.

"PHD" is a Line Material Company Trademark

7.5 kv

50 amperes
4000 amperes
interrupting capacity

100 amperes
8000 amperes
interrupting capacity

Here's Complete "PHD" Line

5 kv Rating	Interrupting Capacity rms amperes	
	2.5 kv*	5 kv**
50 amps.	8,000	5,000
100 amps.	14,000	10,000
200 amps.	20,000	15,000
7.5 kv	Interrupting Capacity	
50 amps.	4,000 amperes	
100 amps.	8,000 amperes	

*or line-to-neutral on 4160 or 4330 volts Gr.Y. **or line-to-neutral on 8330 volts Gr.Y.

150

For information ask the L-M Field Engineer for Bulletins, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

LINE MATERIAL

fuse cutouts and fuse links

1. Variac to control output voltage.
2. Range Switch transfers microammeter from 50 to 1000 microamperes range.
3. Guard Switch for by-passing stray currents to ground.
4. Neon Bulb protects against continuous overload.
5. Dual Range Microammeter measures leakage current.
6. Kilovoltmeter measures output voltage.
7. Calibration Curves translate microamperes into ohms resistance.
8. Power Switch (on-off control).
9. Grounding Post insures protection to operator.
10. Indicator Light (power on or off).
10
4
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7

L-M DC Insulation Tester, being used to check insulation on a Kyle Type H Recloser.

L-M's New DC Insulation Tester Assures More Positive Maintenance For Reclosers

New portable unit operates on 120 volts, 60 cycles; requires low input power; is easily handled by one man. Use of DC gives high degree of accuracy, tells relative strength of insulation, and avoids useless replacement of good insulation. Completely protected so the device cannot be damaged by a short circuit; can measure any part of a number of insulation paths, one stringer or an entire recloser. Costs only $375.

L-M's new DC Insulation Tester is a highly efficient, low-priced portable unit that provides accurate determination of the condition of insulation in reclosers or other apparatus.

With this tester you can greatly improve recloser maintenance. It avoids replacement of insulation that is still in good condition; and it indicates when insulation should be replaced so that a recloser with faulty insulation is not put back on the line.

It may be hooked up to test the complete apparatus, or just one stringer in the unit.

It measures the DC insulation resistance of the entire apparatus or any part, at test voltages from 1 KV to 15 KV DC. It operates instantly, there being no vacuum tubes requiring a warm-up period.

Leakage current is measured by a dual range microammeter with a 50 microampere and a 1000 microampere range.

One man can operate the unit. It weighs only 50 pounds, so that it is easily transported. Input power is low. The tester may be supplied from any 120-volt 60-cycle source.

Fully Protected

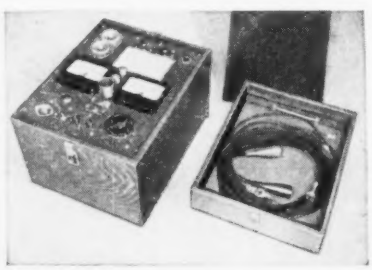
The microammeter is protected against sudden surges and protected against continuous overloads by a neon bulb that fires and by-passes the measuring circuit when an overcurrent occurs. Output current is limited in case of insulation failure by series resistors. The circuit high voltage components are protected against accidental over-voltages by an adjustable gap which discharges the output capacitor through a resistor.

Economical

The L-M DC Insulation Tester costs only $375.00. It takes out the guesswork and assures more positive recloser maintenance. A few moments' time can prevent hours of additional apparatus replacement, and the timely replacement of a faulty piece of insulation may prevent serious damage or complete destruction of valuable apparatus.

Get Complete Information

Ask the L-M Field Engineer for the new bulletin on the L-M Insulation Tester—or get a demonstration. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).



The L-M Insulation Tester is completely self-contained. Cover holds all leads, power cord, and instruction book. The whole unit weighs only 50 pounds.

155-R

LINE MATERIAL

Kyle® Reclosers

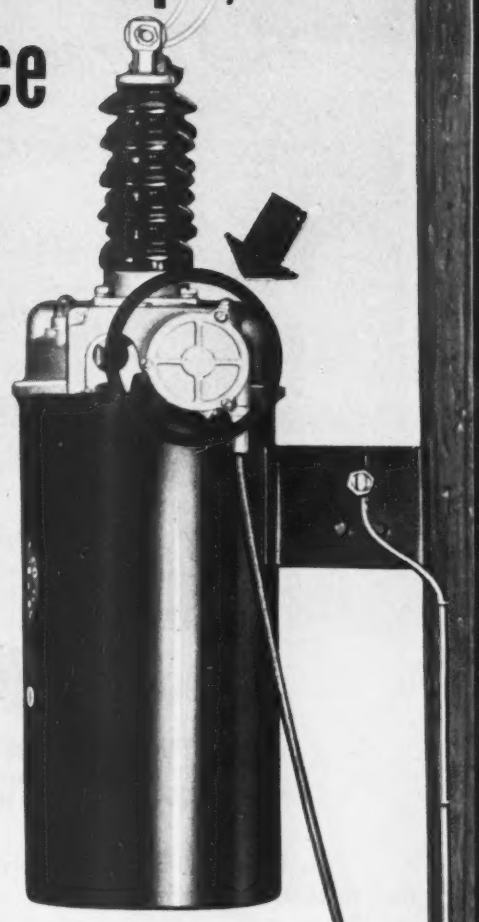
New L-M Manual Remote Control for Reclosers Saves Trouble Trips, Improves Customer Service

L-M's Remote Control for Kyle Type H Reclosers provides manual operation from the base of the pole. It eliminates the need for climbing the pole. No switch stick is needed. Anyone can be instructed to operate the device. The handle can be locked to prevent unauthorized operation.

Use of the device eliminates the need for sending a line crew to open or close a recloser. Farmers or property owners in remote locations can be provided with a key so that they can operate the control upon telephone instructions. This can be particularly valuable when roads are blocked by mud or snow. The saving on one service trip by a crew more than pays for the device.

Let Us Give You Complete Information

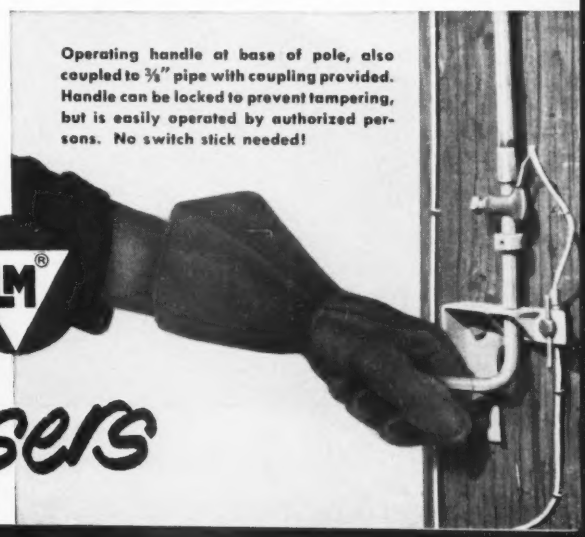
Ask the Line Material Field Engineer for details on the L-M Remote Control, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).



Manual Remote Control attached to sleet hood of a Kyle Type H Recloser. Device cannot interfere with normal operation of the recloser. Easily installed, right in the field. Flexible steel cable is coupled to length of ⅜" pipe.

Features of the L-M Manual Remote Control for Kyle Reclosers

- Designed for simple operation from the base of the pole.
- No switch stick required.
- Permanently lubricated for a lifetime of use. Sealed against damage or interference by insects and weather.
- Allows trip-free operation under fault conditions. The device cannot hold recloser in against a fault.
- Easily installed; may be added to Kyle Reclosers right in the field.
- Control handle can be locked to prevent tampering.
- Available for pole or cross-arm mounting for 1-, 2-, or 3-phase operation. One handle operates all reclosers simultaneously.
- Field-tested under various climatic conditions to assure positive operation.



Operating handle at base of pole, also coupled to ⅜" pipe with coupling provided. Handle can be locked to prevent tampering, but is easily operated by authorized persons. No switch stick needed!

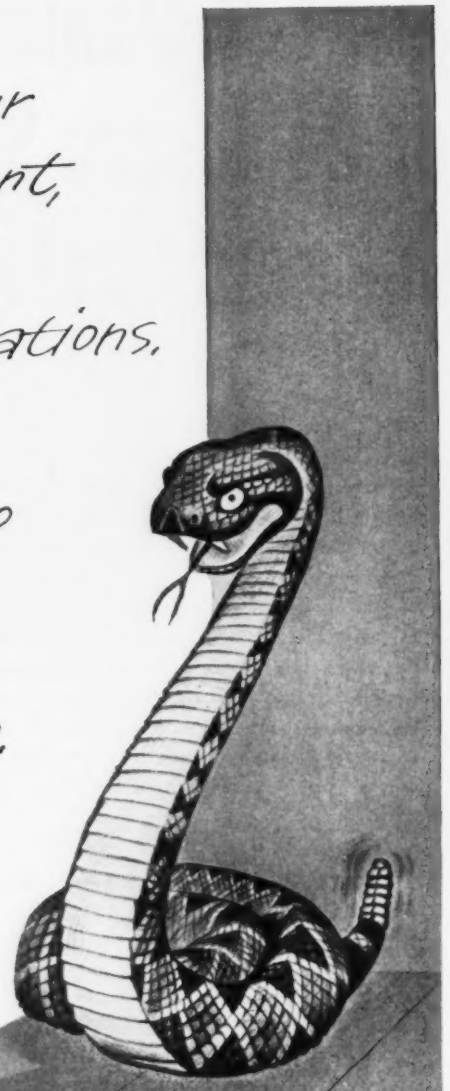
LINE MATERIAL

Kyle® Reclosers

Poised in a corner of your plant, like a deadly serpent, fire is ready to strike!

At unattended sub-stations, in transformer vaults.

Your safest move is to install a KIDDE fully Automatic CO_2 Extinguishing System.



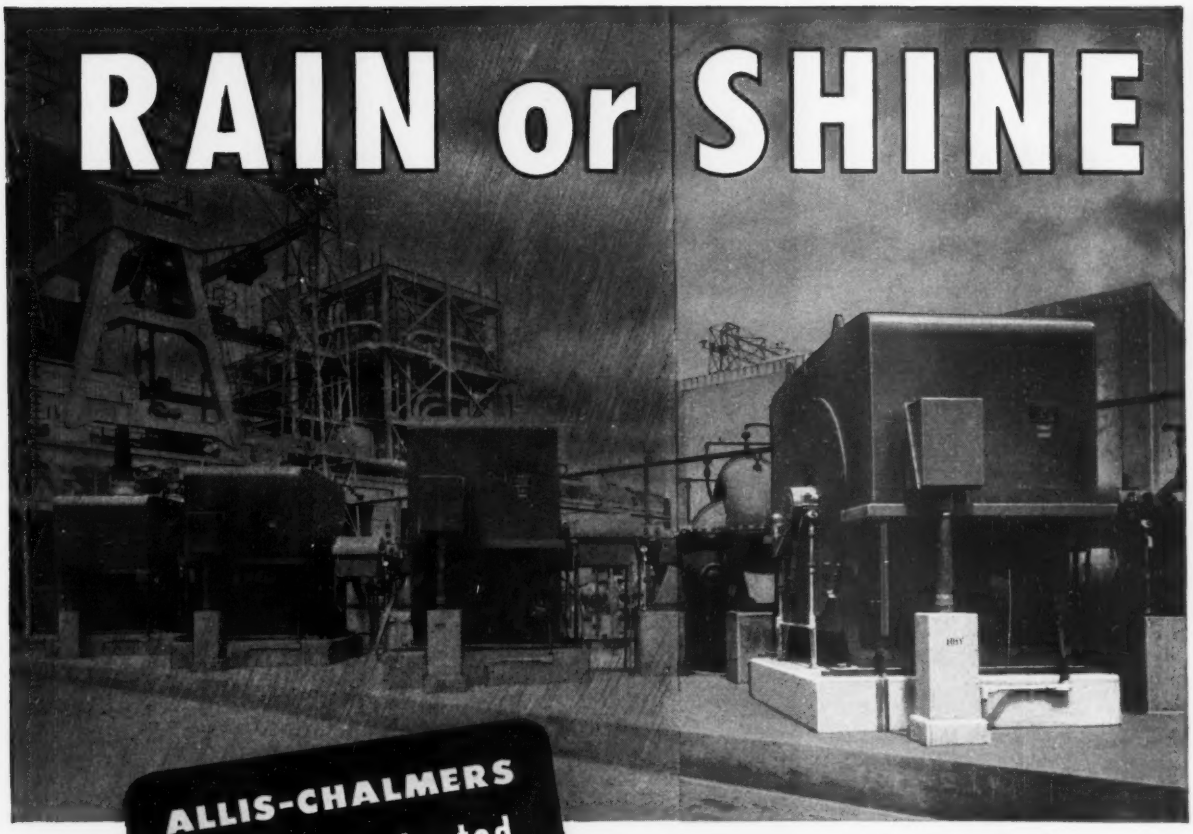
Kidde

Walter Kidde & Company, Inc.
1131 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

Don't get rattled...

for your Kidde dealer

RAIN or SHINE



ALLIS-CHALMERS
Weather-Protected MOTORS

Low-cost outdoor installation plus dependable operation under all weather conditions

Economy plus reliability — regardless of weather conditions — was the combination demanded by Southern California Edison for the circulating water pump motors at the 250,000-kw Etiwanda Steam Station. And that's the combination delivered by the four Allis-Chalmers motors shown above.

Each of these modern weather-protected squirrel-cage motors is rated 900 hp, 4160 volts, 435 rpm. Smaller motors of similar design were supplied by A-C for the station's condensate booster pumps.

Proved by Special Tests

The weather-protected design has been tested under extreme conditions. Running at normal speed and voltage, motors of this type were deluged with water at rates up to 40 inches per hour — driven by winds up to 75 miles per hour. This was done repeatedly from all angles, but on inspection no moisture was detected on the windings. And other tests checked effectiveness in keeping out wind-driven fine sand — a serious threat at this west coast installation.

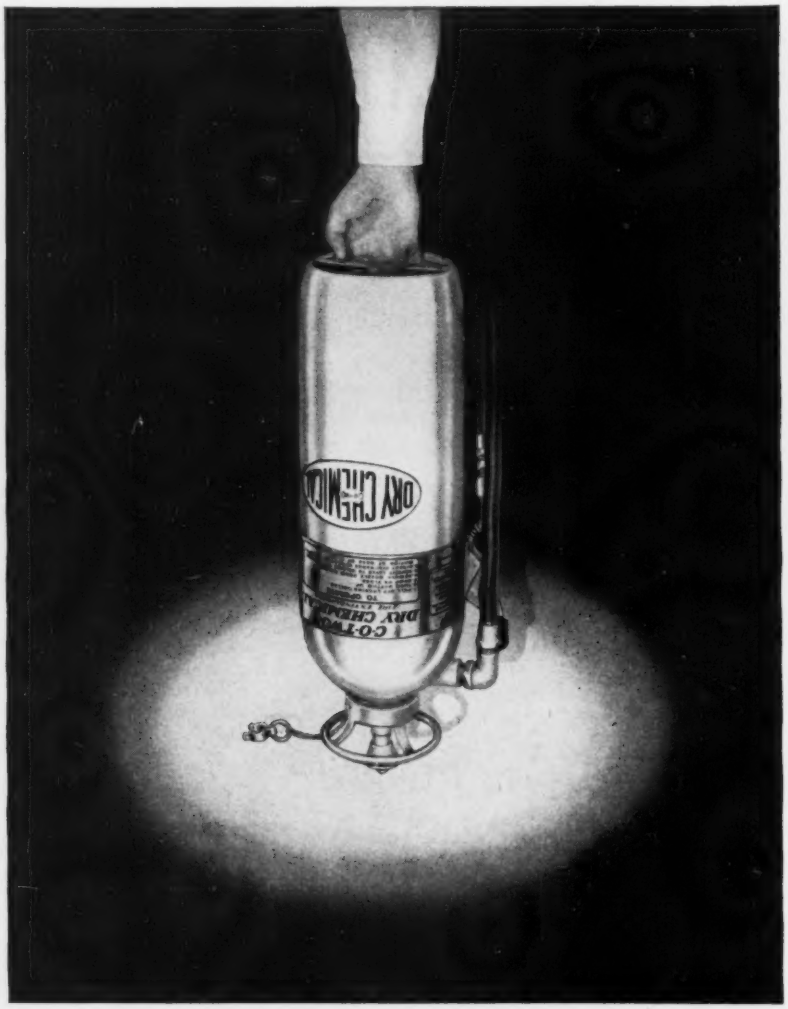
Movie and Bulletin Available

See how A-C test-proved these motors. Ask your A-C representative to show you the 12-minute movie *The Sky is the Roof*. Or write for Bulletin 05B7874. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4176

ALLIS-CHALMERS

Bump that assures positive results



When fire strikes, seconds count . . . your fire extinguishers must be the right type and function properly from the very start . . . failure means serious losses.

The growing popularity of the highly effective powdered dry chemical fire extinguishing agent may be hampered by a drawback . . . settling or packing can occur after a lapse of time. However, with C-O-TWO Dry Chemical Type Fire Extinguishers there's no chance of this happening.

The exclusive inverting and bumping design of C-O-TWO Dry Chemical Type Fire Extinguishers provides mechanical breakage of the dry chemical by shifting its position in the cylinder. This outstanding mechanical breakage, plus continuous inert gas pressured agitation or fluffing of the skillfully blended free flowing dry chemical, guarantee lasting, foolproof fire protection.

No other brand on the market today gives you this extra margin for positive results. Inverting and bumping is only one of many unique design advantages that make C-O-TWO Dry Chemical Type Fire Extinguishers your best buy for killing flammable liquid and electrical fires, as well as surface fires involving ordinary combustible materials.

With C-O-TWO Dry Chemical Type Fire Extinguishers the heat-shielding dry chemical is a non-conducting, non-abrasive, non-toxic, finely pulverized powder compound . . . blankets fire instantly. Sizes range all the way from 4 to 150 pounds capacity . . . all fully approved by the Underwriters' Laboratories, Inc., Factory Mutual Laboratories and Government Bureaus.

Act now for complete free information on these top quality, sure-acting fire extinguishers. Remember fire doesn't wait . . . get the facts today!

C-O-TWO

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 • NEW JERSEY

C-O-TWO FIRE EQUIPMENT OF CANADA, LTD. • TORONTO 8 • ONTARIO

Sales and Service in the Principal Cities of United States and Canada

AFFILIATED WITH PYRENE MANUFACTURING COMPANY

Transmission Towers by AMERICAN BRIDGE handle nation's first 330,000-volt line

● The first leg of the American Gas and Electric Service Corporation's projected high voltage transmission network has been completed with the construction of a 63-mi. 330,000-volt, double circuit link running from Appalachian Electric Power Company's Kanawha River, W. Va., station to its Philip Sporn plant.

The towers for this record-setting line were designed and fabricated by American Bridge as the result of valuable data gathered from the A. G. & E. sponsored 500,000-volt test line at Ohio Power Company's Tidd plant, Brilliant, Ohio, in cooperation with other manufacturers of high voltage transmission line equipment.

These towers are approximately 150 feet tall and carry 6 conductors of 1,275,000 C.M., A.C.S.R. expanded cable (1.6"OD). The towers are designed for straight-line spans of 1700 ft.

The technical knowledge and field experience American Bridge has acquired in this and hundreds of other transmission line installations may be just the answer to your tower problems. Our engineers welcome an opportunity to figure with you without obligation. Just write to the nearest office listed below.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.
Contracting Offices in: AMBRIDGE • ATLANTA • BALTIMORE • BIRMINGHAM • BOSTON
CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • DULUTH • ELMIRA
GARY • MEMPHIS • MINNEAPOLIS • NEW YORK • PHILADELPHIA • PITTSBURGH
PORTLAND, ORE. • ROANOKE • ST. LOUIS • SAN FRANCISCO • TRENTON
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

DESIGN REDUCES FOUNDATION INSTALLATION COSTS. Important savings in time, labor, and materials were made possible through use of steel grillage earth anchors and variable leg extensions as shown above. Many other simplified installation and frill-free construction features are obtained through American Bridge designs.

USS TRADE MARK

AMERICAN BRIDGE

UNITED STATES STEEL

SERVICE-ENGINEERED
For Faster SPEED...Greater SAFETY
KEYSTONE *Ladder Mount*

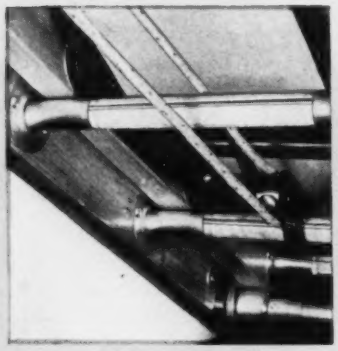
There's extra safety for your workmen . . . greater speed on every job . . . no delays or difficult "spotting," when a Keystone Ladder Mount handles your overhead work.

This quick-acting, ultra-safe ladder mount is *"service-engineered"* at every point for top performance on the toughest overhead jobs . . . *"service-engineered"* eight ways better, to give you faster operation, longer life, and lower maintenance costs. Can be raised or lowered in seconds . . . rotates through 360° at any angle . . . is easily operated by one man. Readily reaches over parked cars, road obstructions, without need to move truck.

All components of the Keystone Ladder Mount are of top quality, with seasoned spruce steel-trussed for extra strength and rigidity. Available in 24′, 28′ and 32′ sizes. Write for full details.

- *EASY TO SPOT*
- *FAST OPERATION*
- *ONE MAN DOES THE JOB*

1. FASTEST RAISING and lowering of counterbalanced ladder is accomplished by quick-acting shielded springs. Sturdy steel vertical approach has knurled rungs for safe, sure footing.



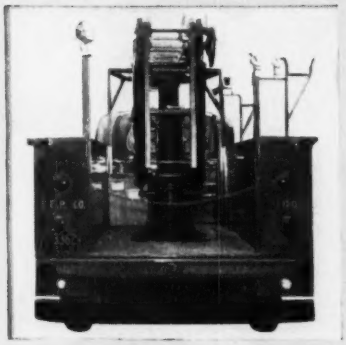
5. RUNGS REINFORCED underneath by metal tie bars for extra safety. Twisting and side play minimized by tube and flange combination at ends of rungs.

SERVICE-ENGINEERED by ELECTRIC SERVICE

ELECTRIC SERVICE MANUFACTURING CO.

AMERICAN BRIDGE

UNITED STATES STEEL



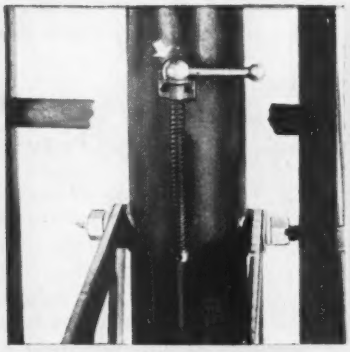
2. SAVES TRUCK SPACE. Radius of mount is only 21" . . . leaves plenty of room for other equipment Mount can be easily removed by loosening only eight bolts.

3. RUNGS EASILY REPLACED when worn, by removing the bolts holding the flanges and inserting new wooden rungs.

4. POSITIVE STRENGTH and safety are provided by strong wooden side rails, trussed and reinforced with steel "A" braces.

6. STURDY PLATFORM, with fast automatic operation, is fully adjustable . . . provides perfectly flat surface for safe, comfortable footing.

7. COMPLETE CONTROL of fly ladder is assured. Handwheel and windlass permit easy raising, hand-brake controls descent.



8. SAFETY LOCK . . . When workman is on fly ladder, lock against vertical movement cannot be unlocked.

Comparative tests conducted by leading utilities companies give positive proof that

KEYSTONE LADDER MOUNT

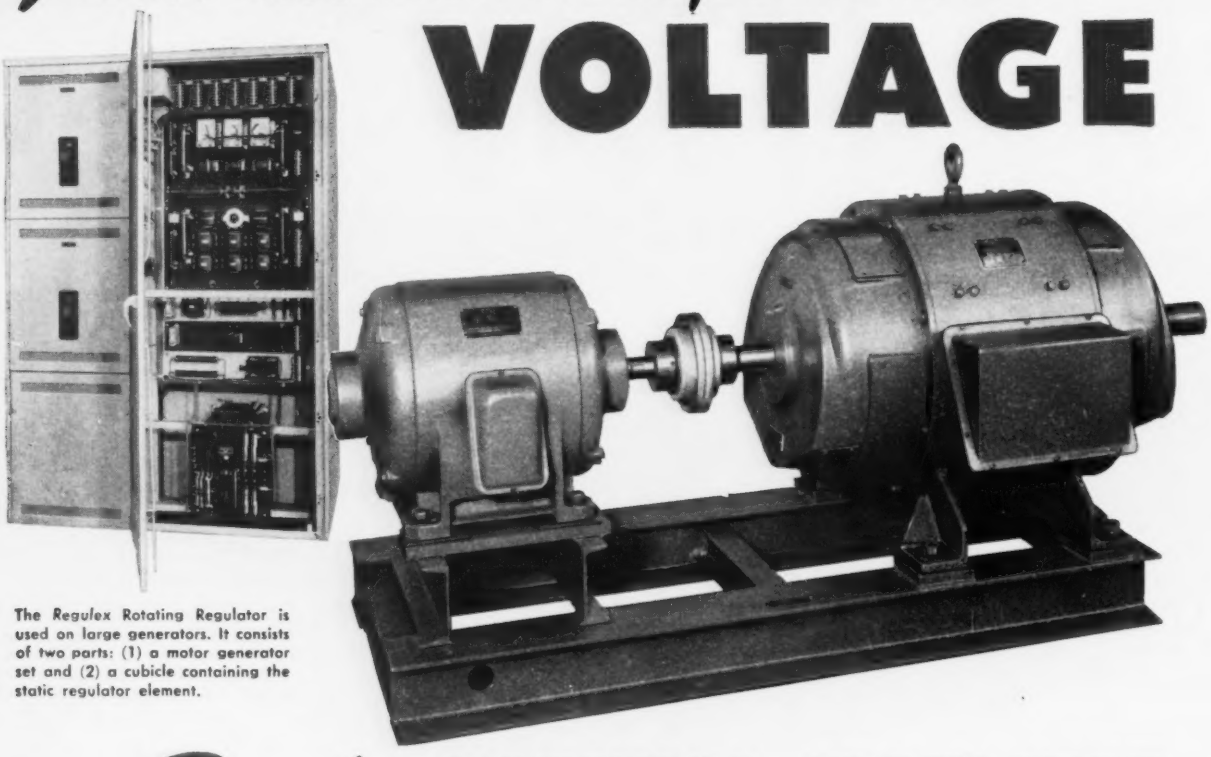
is superior in strength, safety and speed of operation.

Optional additional equipment includes safety marker lights, pilot lights, warning buzzer, or automatic switch to prevent truck movement while ladder is raised.

Philadelphia 32, Pa.

Represented in Canada by Lyman Tube and Bearings, Ltd., Montreal and Toronto

Fast, accurate, dependable VOLTAGE



The *Regulex* Rotating Regulator is used on large generators. It consists of two parts: (1) a motor generator set and (2) a cubicle containing the static regulator element.

Regulex ROTATING REGULATOR

★ **Maximum Productivity from New Generators**
★ **New Efficiency from Present Installations**

Regulex voltage regulators incorporating automatic minimum excitation permit generator operation close to the stability limit . . . much closer than manual operation allows. The sensitivity and exceptional response of the *Regulex* voltage regulator and associated equipment establish and maintain a safe ratio between generator load and field current . . . increase operating limits at any given power factor load . . . assure the proper reactive kva division. The *Regulex* voltage regulator does not require multiple special fields in the exciter — may be applied to any standard shunt machine. Write for literature. A-4189

New Magnetic and Electronic Amplifiers

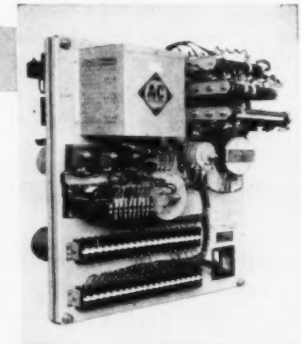
Versatile "Tools" Used in Solving Your Particular Voltage Regulation Problem

For special industrial and military regulating systems, added flexibility is obtained by using magnetic and electronic amplifiers. These components *supplement* but do not replace the *Regulex* rotating amplifier in most applications.

The magnetic amplifier is used primarily where reversible output from the amplifier is not required. Special exciter design is eliminated in such applications. The shock-proof characteristics of the magnetic amplifier make it particularly adaptable to military voltage control.

Electronic amplifiers are used only on applications that require exceptionally high sensitivity.

Applications of magnetic and electronic amplifiers for purposes other than voltage control include speed, current, and tension regulation.



Voltage regulator with current limiting device. Used for control of static rectified dc power supply.

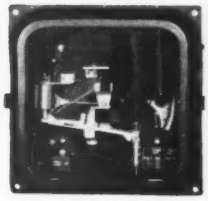
REGULATION

For ANY *Size Generator*

Rocking Contact VOLTAGE REGULATORS

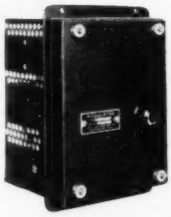
dc Applications

The Type VD Regulator has been designed to meet the demands of voltage or current characteristics of dc machine operation. Resistors are cut in and out of the exciter shunt field by the *Rocking Contact* sector. No sluggish, time wasting relays. No vibrating or sliding contacts to wear out. A small movement of the *Rocking Contact* sector over a curved commutator covers the entire regulating range. Type VD regulators are available for all dc generators. Write for Bulletin 14B6137A.



VD-2 Regulator for dc generators from 10 kw at 80 rpm to 200 kw at 3600 rpm

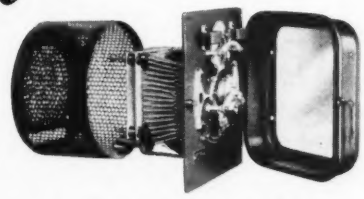
ac Applications



Types V-00 and 221 Regulators

FOR SMALL GENERATORS

Rocking Contact Voltage Regulators are available in two types for use on small ac generators with direct-connected exciters — Type V-00 for generators to 157 kva maximum at 3600 rpm; Type 221 for generators to 438 kva maximum at 3600 rpm. These regulators can be modified for temperature compensation, shock mounting or other special requirements. Bulletin 14B6143A gives details.



Types A, B, & C Regulators

FOR MEDIUM SIZE GENERATORS

Types A, B, and C Regulators differ only in kva range.

Type A Regulator— for ac generators, 125 kva at 257 rpm to 1750 kva at 3600 rpm.

Type B Regulator— for ac generators, 1000 kva at 257 rpm to 6250 kva at 3600 rpm.

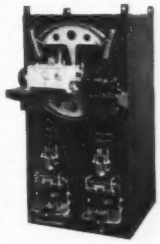
Type C Regulator— for ac generators from 3125 kva at 257 rpm to 25,000 kva at 3600 rpm.

All have guaranteed sensitivity of plus or minus 0.5%. Write for Bulletin 14B6035B.

FOR LARGE GENERATORS

Type J *Rocking Contact* Regulators are of the exciter field rheostatic type designed for the control of large synchronous machines. This regulator consists of two parts: (1) a voltage sensitive torque motor control element for panel mounting; (2) a motor-operated exciter rheostat with high speed field forcing contactors. Write for Bulletin 14B6015A.

Type J Element



Motor-Operated Rheostat

Regulex and *Rocking Contact* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

Milwaukee 1, Wisconsin

KERITE
CABLE-GRAM
TIME IS THE MEASURE OF ALL THINGS. FEW OF MAN'S INVENTIONS CAN STAND ITS MERCILESS JUDGEMENT. YET KERITE FOR OVER 90 YEARS HAS THRIVED AND SPREAD AND GAINED THE CONFIDENCE OF THE USERS. TIME, INDEED, GIVES KERITE ITS UNQUALIFIED RECOMMENDATION.
THE VALUE AND SERVICE LIFE OF A PRODUCT CAN BE NO GREATER THAN THE INTEGRITY AND CRAFTSMANSHIP OF ITS MAKER.
1854
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THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
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Product Competition vs. Market Development

"The job of my company is to sell the appliances we make—period. We are out to get a bigger chunk of the existing market which just naturally gets bigger every day. Whether or not millions of American homes have enough wiring to handle appliances safely and satisfactorily is no concern of ours. Our time and energy and money will be spent in selling our appliances. Let the utilities worry about inadequate wiring. Or anyone else who wants to. We won't."

The foregoing is the gist of much more extended and emphatic remarks by a sales executive of one appliance manufacturer. The subject at the lunch table was adequate wiring and the need for all-industry promotion in that field.

Unless the various segments of the electrical industry—manufacturers, distributors, dealers, contractors, and utilities—are at this moment engaged in a lot of mutual kidding and double talk, the remarks summarized above can hardly be taken as representing the general attitude of appliance makers. We hope they can't.

In Electrical World last week (Nov. 23, p 10) there was a news story telling about the formation of a special conference group named by national associations of the industry to coordinate promotional programs. Lyle G. Hall, retiring president of Nema, made the announcement at the association's annual meeting this month. Adopted as the first aim of such coordinated effort was "Electrical Modernization," a banner under which the whole industry can unite. And certainly promotion of adequate wiring should be far up front in the parade led by that banner.

Product competition is a fine thing for any business. It has done much for buyers of electric appliances. From it have come better and again better and still better refrigerators, ranges, water heaters, food freezers, clothes washers, toasters, flatirons—name them all; each one is a better product today than it was yesterday.

Better products make larger markets. But in the case of electric appliances the market is hindered in its expansion by the condition of the wiring in most American homes. By itself competition between makers of appliances will never remove this obstacle in the way of market expansion. A case in point is experience in the sale of room air conditioners. It is said that 15% of those sold so far have been returned to dealers because the wiring in buyers' premises was incapable of handling them. This would not have occurred if wiring adequacy had been sold at the same time, or before.

Recognition of the need for wiring safely capable of bringing proper voltage to the terminals of appliances is a major inclusion in the "Electrical Modernization" theme. That theme will be just a couple of empty words if the attitude stated at the beginning of this editorial really prevails among any considerable number of appliance makers.

L. E. Barrett, vice-president of the National Association of Electrical Distributors, speaking to the association's board of governors, characterized inadequate wiring as a dead-end street and said many appliance distributors are racing neck and neck down this dangerous road. They would not be doing so if the manufacturers of the goods they handle were giving a little more attention to market development and a little less to product competition.

"Be Modern!—Live Electrically!"

Electric ranges, water heaters, food freezers and clothes dryers especially, and all other home uses of electricity generally, will receive greater promotional impetus in 1954 than ever before. That is the recently announced intention of the Residential Promotion Committee of the Edison Electric Institute.

Produced by the Public Utilities Advertising Association, the slogan, "Be Modern!—Live Electrically!" was offered by the committee as a banner under which manufacturers, distributors, dealers, and utilities can march together towards complete electrification of the American home.

Coinciding with the industry-wide sales campaign calendar announced earlier, five programs have been set up for 1954—the range in March, April, May, with greatest concentration of effort in April; the water heater in the same months, but with effort peaking in May; the food freezer in May, June, July, August, with heaviest emphasis in June; the range again in September, October, November, bearing down hardest in September; the dryer in the same months but getting strongest push in October.

For each campaign a consumer folder and a dealer kit of logos of the the slogan, window streamers, counter cards, banners, and mailing pieces will be produced by EEI. With these items plus others locally produced or obtainable from other interested sources, it is intended that all elements of the electric industry will unite in local campaigns. Information on the availability of this material as it is produced will be placed in the hands of appliance makers through the National Electrical Manufacturers Association so that they can coordinate their own activities with those of the national program. A detailed announcement of each campaign will be given to the industry about three months in advance of campaign periods so that no one can advance the excuse that he had not been warned in time to prepare.

There have been previous efforts and plans for intra-industry cooperation in the promotion of electricity uses in the home. Some have been successful, some not entirely so, but all have been limited to single appliances or applications. This is the first time, since the war at any rate, that a promotion encompassing all the home services of electricity has been undertaken. It is a big idea. It challenges the enterprise and energy of every segment of the industry to make the accomplishment as big.

More Water Is Needed

Rainfall across the nation in an average year aggregates some 1.5×10^{15} gal or about 10^{16} lb. Some seeps into the earth, some evaporates, some gets used by humans and industry, only a third (say 3.75×10^{15} lb) flows down the rivers. These rivers along with harbors, lakes, wells, etc provide the condensing water that so greatly extends the power capacity of each pound of steam used in a condensing cycle.

By 1963 the kilowatthour production will rise to 900 billion and at least 700 billion will originate in steam power plants. They will be needing some 7×10^{14} lb of water to condense the steam. A growing fraction of the plants will locate on the nation's rivers—say half the total. Thus the demand on the rivers can be some 3.5×10^{14} lb per year out of the 3.75×10^{15} lb that will be flowing past their sites.

In some areas there will be enough, ten times over, provided the same water can be used several times by successively located plants. It will also depend upon industrial plants not heating or polluting the remaining nine-tenths too badly. But in other areas, particularly the Midwest, shortages are now apparent and will become more acute.

At the moment then there is no occasion for worrying about a crisis. The water may readily suffice as long as the coal does, and cooling towers will substitute when necessary. Progressive switch to nuclear reactors will neither relieve nor aggravate the situation.

Meanwhile, the steadily growing signs of water shortages in some regions of the country is reaching the critical stage. The mid-September issue of Power (a McGraw-Hill publication) says, "Cooling towers will be used for at least 50 new units." This can be taken as indication that the industry might find it worthwhile to look into the stream flow of the rivers where it expects to locate steam stations. It also indicates a need for more studies of the efficient design of cooling equipment. With this in mind Electrical World has already begun to compile and analyze such data. It is always wise to remember that to be forewarned is to be forearmed.

With Every Speech, a Press Release

Many reasons have been advanced for the growth of federal electric power. But seldom mentioned is the one factor that might have been the most important of all—Federal power has always gotten and still gets good publicity. Those affiliated with the power activities of the government have always lived by the well-worn motto of advertising salesmen, "The more you tell, the more you sell."

They are talkers. They'll make a speech practically anytime, anywhere. They'll talk in the banquet hall, in the convention hall, or at the county fair. They'll talk from the platform or the radio station. But they'll not talk extemporaneously. This type of speaking they consider a mistake. They like to compound the effects of their oratory by getting additional publicity in the columns of as many newspapers as possible. And busy reporters seldom pay much attention to a speech unless they can get a press release from which to work.

This is one factor that has advanced the growth of federal power, the cheaply mimeographed press release. And from such releases have come deluges of newspaper stories favorable to federal power plus many editorials and feature stories.

In contrast, too many utility company executives have been silent too often. In too many towns the people sit in well-illuminated rooms but are still in the dark about the company that supplies the electricity to illuminate them. And too many customers of electric companies know too little about the contributions the free enterprise system has made to their high standard of living.

Even when company officials have spoken out, the effects of their speeches usually have been limited to the few persons who have heard them. It is time for the business-managed companies to adopt a new rule for their executives: "A speech at every opportunity and a press release for every speech."

THE ELECTRICAL WEEK

The Issue's News Highlights—Southwest Power Cooperative, made up of four statewide co-op organizations, says its objective is providing an adequate supply of power to farmers at reasonable rates . . . Federal agencies will furnish data on "present worth" of Central Valley Project in connection with proposed purchase of CVP by California.

Kentucky utilities and East Kentucky Rural Electric Cooperative are reported near settlement of dispute on construction and operation of transmission lines . . . Court of Appeals sets Dec. 23 to hear arguments in review of St. Lawrence project license issued New York Power Authority by FPC.

Republican policies have killed hopes of future hydroelectric expansion in the Pacific Northwest, Sen Warren G. Magnuson (D-Wash.) charged in a speech before labor leaders in Seattle. "I've had the President of the United States tell me that it wasn't right for us to have cheap power . . . because it wasn't fair to the rest of the country." The President said the area could do anything it wanted with private enterprise, the Senator recalled, but added it was unfair for the government to dip into the treasury for dam projects there.

In a move that was unexpected because his term had two more years to run, Eugene R. Hoffman, superintendent of Seattle City Light, resigned effective Jan. 1 "to enjoy a period of rest."

Citizens at a mass meeting in Point Pleasant Beach, N. J., told representatives of Jersey Central P&L with a chorus of boos that they didn't want the company to build a new generating station on an island in the Manasquan River. They asked for a referendum on the issue.

Ten years from now atomic power may account for 2 million kw of a national power output of 170 million kw, A. C. Monteith, Westinghouse VP, predicted at the dedication of a new laboratory of Carnegie Institute of Technology in Pittsburgh, Pa.

Washington Water Power intends to build Noxon Rapids Dam in northwest Montana whether the proposed merger with Puget Sound P&L fails or not, Pres Kinsey M. Robinson told a group of traveling newsmen. He said company hopes to begin construction within a year.

Montana will get another power project as a result of a decision by Interior Department to build a dam instead of a pumping plant on Porcupine Creek. Construction of the dam will start next spring, but work on the 18,000-kw power house will have to await Congressional approval.

Electric Companies Advertising Program got two new recruits: South Carolina Electric & Gas and Oklahoma Gas & Electric.

Edward U. Condon, atomic scientist who formerly headed the National Bureau of Standards, said in St. Louis that proposed amendments to the Atomic Energy Act to permit private development of nuclear power "would tend to weaken the possibility of effective international control."

Off the Washington Wire—Bonneville Power Administration probably will ask for a supplemental appropriation to restore some of the transmission line construction previously knocked out of its budget for the present fiscal year.

Atomic Development Mutual Fund, a new firm which will invest in activities resulting from atomic science, filed a registration statement with SEC to sell 90,000 shares of capital stock.

Federal Power Commission plans to streamline its rules for applying for a hydroelectric license. One thing the new procedure will do is eliminate the requirement to file a lot of information that is no longer considered pertinent.

FPC authorized Wisconsin P&L to absorb Interstate Power Co of Wisconsin. Wisconsin P&L will buy all Interstate common stock for $2,359,730.

Alabama Power Co applied for FPC permission to build several power dams on the Coosa River in Alabama and Georgia . . . PUD No. 1 of Chelan County, Wash., asked FPC for a preliminary permit for a hydro project on the Columbia River in Chelan and Douglas Counties.

A law firm which represents Virginia Electric & Power Co received a state corporation charter for the purpose of producing power from nuclear sources. According to the statement of intentions, activities will be confined to manufacture of nuclear power equipment and development of nuclear power, with no intention of assuming a public utility responsibility.

A construction budget of $261 million in the next ten years was announced by Idaho Power Co. This is more than 2½ times the amount spent on new capacity since the war. Pres T. E. Roach predicted power consumption in southern Idaho and eastern Oregon will more than double by 1962.

Bluffton (Ohio) Village Council plans to negotiate contracts for wholesale power. Village had been split for months on question of whether to buy wholesale or sell the municipal power plant outright.

IBEW-AFL, testifying in Vepco's rate hearing before Virginia State Corporation Commission, asked the commission to take into consideration the fact that wage negotiations were going to start soon, and "the increase necessary in our wages will amount to a substantial cost to the Virginia E&P."

Congratulations—Charles M. Hagan, executive vice president of Atlantic City Electric Co, was elected president of New Jersey Utilities Association . . . Okonite Co elected VP R. Stuart Keefer president to succeed Albert F. Metz, new board chairman and chief executive officer. Other officers appointed: Edward D. Youmans, vice president, research and product development; Charles M. Kirkland, vice president, sales; and David W. Nurse, vice president, manufacturing.

Four-State Co-op Bloc Organized

New association, made up of statewide groups representing 159 co-ops, would buy federal facilities if they go on sale

Providing farmers with an adequate supply of power at reasonable rates is the chief objective of the newly formed Southwest Power Cooperative.

The organization, composed of statewide cooperative groups in Arkansas, Kansas, Oklahoma, and Texas which represent 159 cooperatives, hopes to achieve this goal through purchase of existing federal power lines and facilities if the government should put them up for sale, construction of generation and transmission facilities, and purchase of blocks of power from federal, municipal, and private sources with arrangements for wheeling and delivering power to the co-ops.

Integration of Facilities . . . Southwest Power Cooperative envisions integration of hydroelectric and steam power facilities in a six-state area. However, co-op associations in Missouri and Louisiana have not yet signified their intention of joining the new group. SPC was incorporated in Oklahoma City last week as a four-state organization.

President of the new association, Truett Bailey of Cleburne, Tex., manager of Johnson County Electric Cooperative, said he thought private electric companies in the area would cooperate in integration of power facilities "if they see they can get a good contract and cheaper operation."

Several utility executives in the Southwest area indicated they would be willing to negotiate with SPC concerning integration of facilities if they received a reasonable proposal from SPC.

Why SPC Was Formed . . . Bailey explained the reasons for the formation of SPC as follows:

"It's a case of Southwestern Power Administration being halted by Congress, temporarily at least, by restrictions on continuing fund used by SPA for power interchange payments.

"Facing this situation we were forced to look for a solution to our power supply problems within the framework of the Eisenhower Administration's power policy. Southwest Power Co-op is the answer. It is a local agency, organized by local people, and managed by those who will get electric service from the power co-op if we are successful in our plans.

"To meet this challenge, we are forming an organization in the area served by Norfork, Bull Shoals, Denison, and the Narrows Dams and where Blakely Mountain and Table Rock Dams may soon be producing power.

"The Southwestern Power Administration presently markets power from these dams. Although the cooperatives have preference rights under the 1944 Flood Control Act, only one-third of the power produced at these tax-built projects is going to the rural electric co-ops. Municipal systems are getting slightly under 10% of this power, and the remaining 57% is going to the commercial power companies as of 1953. Even more power went into private systems when there was a surplus of water in the reservoirs and it was necessary to sell dump power.

"Southwest Power Cooperative will endeavor to obtain additional power from these dams and will integrate steam generation with available hydroelectric power where possible so consumers served by the cooperatives and the municipal systems can receive the same benefits now being monopolized by the commercial power companies."

Hoover's Position . . . Harry L. Oswald, executive manager, Arkansas State Electric Cooperative and a director of the SPC board, pointed out that although neither President Eisenhower nor Secretary of Interior Douglas McKay had called for sale of federal power facilities, former President Herbert Hoover has advocated that the federal government get out of the power business. Hoover heads commission studying the government's role in the power field.

Other Officers . . . Other officers of SPC, elected at organizational meeting held Nov. 17 at Little Rock, Ark., are: Vice President, R. G. Gates, Berryville, Ark., manager, Carroll County Electric Cooperative; secretary-treasurer, Doyle Pope, Norman, Okla., president, Oklahoma Statewide Electric Cooperative. These three officers and nine other co-op representatives make up board of directors. Each state has three representatives on the board.

SOUTHWEST POWER COOPERATIVE officers study the incorporation papers (l to r): R. G. Gates, vice president; Truett Bailey, president; and Doyle Pope, secretary-treasurer

CVP Worth Data . . .

. . . to be provided by federal agencies preliminary to purchase by California

Federal agencies have agreed to furnish data for figuring "present worth" of the Central Valley Project in connection with the proposed purchase of that project by California.

This was the major agreement reached at a three-day series of discussions between state and federal representatives on proposed purchase of the vast irrigation, flood control and power project being built by the federal government.

Meetings Exploratory . . . Federal agencies taking part in the discussions emphasized the meetings were entirely exploratory and they had no final authority to enter into definitive negotiations. That authority rests with Congress and the President.

The state officials, representing the California Water Project Authority, are acting under a directive of the California legislature which directs them to explore the possibility of buying the federal project.

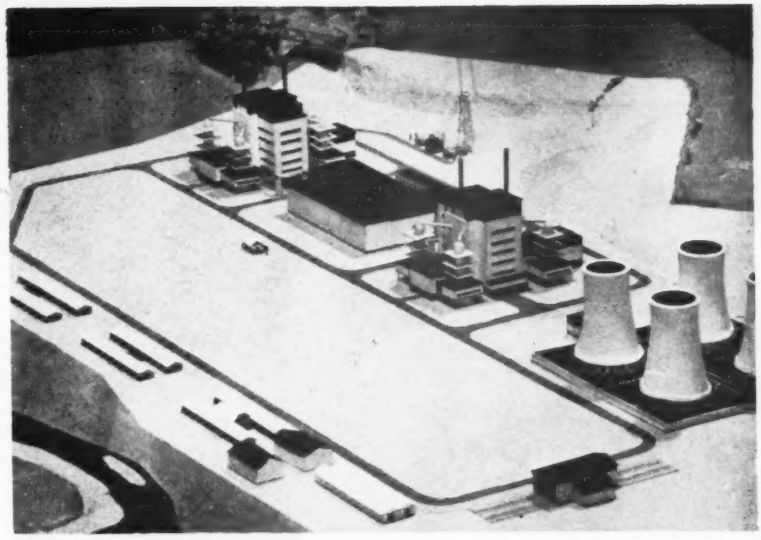
Memorandum Signed . . . A memorandum of understanding was signed by parties of the discussion held in Washington Nov. 17-19. Under this memorandum, Interior Department agreed to obtain the position of the Administration in regard to:

- Interest-free financing by the federal government of irrigation as one of the terms of transfer.
- A California proposal based on present-worth settlement of the irrigation investment.
- Interest rate to be used in computation of present worth.

Bureau of Reclamation is to furnish estimates of anticipated power, water and irrigation revenues from the several individual developments which are a part of CVP. Its analysis also will include pertinent information on all authorized developments in the big project.

In turn, the California representatives have agreed to make "present worth" computation using the data furnished, and to submit certain tentative conditions under which the state might make the purchase.

Discussions are to be resumed after these data are exchanged.



British First: An Atomic Pilot Plant

This is a model of an experimental nuclear power station using uranium as fuel which Britain is building in Cumberland, England. When completed in about 18 months, the installation is expected to develop 50 kw. A second plant, this one to produce power on a commercial basis, is already in the design stage. This, according to Sir Christopher Hinton, in charge of atomic energy production, will feed power into 132-kv grid lines and will be "big enough to make it worth while to buy the switchgear." The second station will be a full-scale, dual-purpose reactor using plutonium as fuel.

In the scale model of the first plant, above, the large, low building is the turbine house. Heat is generated in graphite-moderated uranium piles (reactors) on either side. Heat is transferred by gas to four vertical boilers around each reactor. Fans in the low wings on each side of the reactors circulate the gas. Steam passes to the turbine house, where it drives four turbogenerators. The four towers at the right are for cooling the turbine condensers.

Kentucky Co-op, Utilities Near Accord on Dispute

Kentucky electric companies and East Kentucky Rural Electric Cooperative Corporation are nearing a settlement in a long and bitter controversy over construction and operation of transmission facilities.

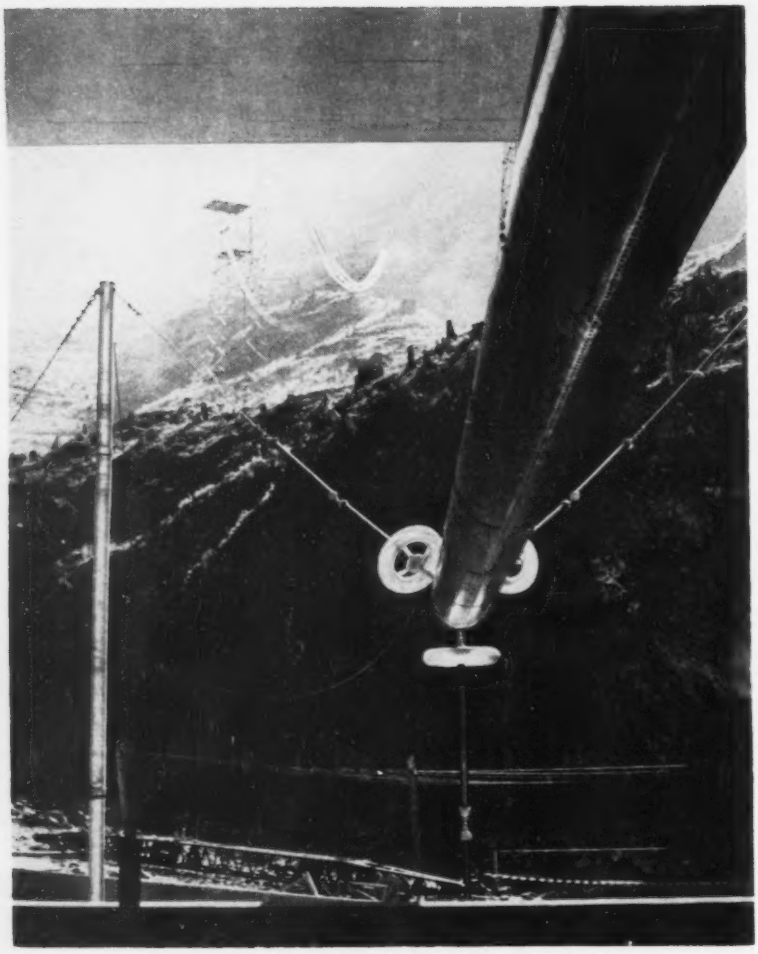
Rural Electrification Administration in Washington, which has been acting as a mediator in the latter stages of the conflict, indicated that an operational scheme has been worked out. Big problem left is the administration of numerous interconnections which would be a part of the final settlement.

Cases brought by electric companies in the area before the Kentucky Public Service Commission and state courts sought to prevent co-op construction of transmission lines. The court upheld the co-op effort and funds were recently released for construction of some 184 miles of transmission line.

In an effort to prevent duplication of transmission facilities, the companies offered to lease the co-op lines with full responsibility to operate, maintain, pay taxes, and amortize them. This offer was turned down flatly by the co-ops.

The co-ops countered with a plan for extensive interconnections between the co-op and company systems, and this plan has the general approval of REA.

In a recent statement, REA Administrator Ancher Nelsen said, "There does remain the problem of administration which will have to be worked out between the power companies and the co-op, but this should not be an insurmountable problem if both parties will keep in mind the benefits there are to be gained in a settlement."



Loudest 'Voice' in the World

World's most powerful radio transmitter, operating at 1,200 kw, was placed into operation this month at the U. S. Navy installation in the Cascade Mountains at Jim Creek Valley, Wash. New equipment enabled the Navy to flash instantaneously a wireless message around the world directly to all of its ships.

View from transmitter building along antenna lead-in trunk (above) shows 145 ft bus tower halfway up mountain, one of 13 which support transmission line. "Doughnuts" are corona shields which guard trunk from corona discharge.

Jim Creek Station was begun six years ago by the Navy and Radio Corp of America.

U. S. Court Sets Dec. 23 for St. Lawrence Hearing

U. S. Court of Appeals has granted a motion to expedite legal action involving the St. Lawrence River power project.

At a recent hearing, the three-man court ordered oral argument set for Dec. 23 in the review of the project license granted the Power Authority of the State of New York.

This would clear the way for final Supreme Court action in the case before adjournment next June in the event the case is again appealed. Should the license be upheld, New York State would be able to begin construction next summer.

Two opponents of the New York Power project are seeking to invalidate the license granted the state authority to build the U. S. portion of the international water power project. These are the Central Pennsylvania Coal Producers' Association, which claims the project would hurt the chances of an expanding coal market in the area, and Public Power & Water Corp of Trenton, N. J., which unsuccessfully sought a license for the project.

Lake Ontario Landowners and Beach Protective Association asked for a review on grounds that the project, as licensed, might raise the water level of the lake and damage beach property.

3 Utilities in Oregon Upheld on Surcharges

Oregon Utilities Commissioner Charles H. Heltzel has ruled that three private utilities were justified in adding 20% surcharges to billings during hydroelectric shortage to pay for excessive and abnormal steam cost and dismissed complaints of State Rep Monroe Sweetland and others.

Heltzel said Sweetland failed to offer evidence supporting charge utilities' rates were excessive and the commissioner specifically noted Portland General Electric Co had cut rates $51 million from 1939 through 1951 and that Pacific Power & Light Co and Mountain States Power Co also had made reductions. Heltzel noted Oregon rates are 50% below 1939 and 50% below national average.

Answering Sweetland's charge earnings should be 4% instead of 6%, Heltzel declared, "On the contrary, all witnesses unanimously agreed that the 4% rate of return would amount to condemnation."

GOP Congressman Backs High Hells Canyon Dam

Republican Rep Walt Horan of Washington State's Fifth Congressional District came out this month in favor of a federal dam in Hells Canyon for its reclamation benefits. Horan is one of the first GOP legislators in the Northwest to endorse the federal dam.

"I admit that three low dams on the Snake River will produce power more quickly," declared Horan, "but some people are so hungry for power they overlook long-range benefits."

Calling for a "balanced" development of the Columbia River and its tributaries, Horan declared the Idaho Power Co's three low dams would not afford recreation, reclamation, flood control, or other benefits.

Water Supply Problems . . .

. . . and conservation methods are discussed by Rutgers professor at New Jersey Utilities Association meeting

Urgent water supply problems facing New Jersey and some water conservation methods were outlined by Dr Thurlow C. Nelson of Rutgers University and chairman of the New Jersey Water Policy and Supply Council. These subjects were discussed before the annual meeting of the New Jersey Utilities Association Nov. 20 at Absecon, N. J.

Charles M. Hagan, executive vice president of Atlantic City Electric Co, was elected president of the association at the meeting.

Dr Nelson declared that approximately 65% of the water supply systems in the northern metropolitan area depend on wells. In addition, he said, there are hundreds of private industrial wells, some of substantial size, which furnish pure water required by many industries.

Hot Weather Intensifies Shortages . . . Dr Nelson stated that water shortages have been intensified by exceptionally hot weather experienced in recent years while increasing losses caused by evaporation from reservoirs and greater transpiration from vegetation. Glaciers and ice caps all over the world are at their lowest resulting in a rise in ocean level in their area of approximately 0.75 ft, he said.

Temperatures in New Jersey, Dr Nelson said, have been rising since 1920, while rainfall has shown a downward trend since 1909.

Greater use . . . Other contributing factors to the present water situation, the speaker stated, is the unprecedented growth in new industry and new housing. Washing machines, automatic dish washers, garbage disposal units, and home air conditioning, he said, all place new burdens on the water supply.

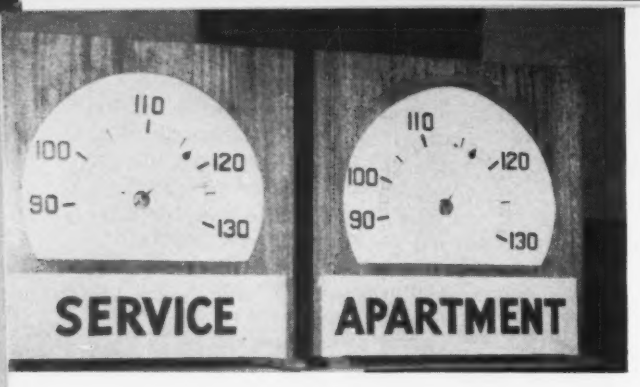
In the Atlantic City area potable water is obtained from 800-ft wells, previously artesian flowing, Dr Nelson pointed out. At present, he said, the static water level is down to about 72 ft below sea level. But as yet the sea has not broken through to salt up the water-bearing horizons. Nelson said this hazard exists along the coastline but was a major condition in the lower Delaware River area. He noted that an Incodel (Interstate Commission on the Delaware River Basin) study emphasized the dangers to underground water supply which will follow increased percolation from the river and reduced flows following greater diversions out of the river valley for water supply.

Increasing supplies . . . Methods of increasing water supplies or conserving existing supplies were listed by Nelson as (1) interconnecting supplies, (2) metering of individual services, (3) rehabilitating canals, (4) completing projects for greater supply to a reservoir, (5) completing a reservoir, and adding flash boards to give adequate supply for the present, and (6) control over subsurface supplies.

Future plans to augment water supplies in Jersey, he said, include (1) development of new sites for reservoirs (2) control of soil erosion, and (3) prevention of floods.

TV Strikes Out for Greener Fields

A lady teller at the new Radio City branch of the New York Savings Bank is shown comparing the signature on a withdrawal slip with the customer's original flashed on a television screen from the bank's headquarters. It is part of a Teller-Vision system which enables tellers at the branch to check on signature cards, balance and interest statements and other records of a particular depositor. The arrangement is cutting daily operating costs by 25%. It means that the branch can stay open 2½ hours longer each day because TV passes on clerical work to the main bank. Three receivers are used in the closed circuit setup. A similar one is used from the banking floor to the clerical offices and files in the main building.



Highly Volted . . .

. . . until the Knickerbockers decided to turn on the appliances in the apartment

Things were serene . . .

. . . on the domestic scene . . .

Consolidated Edison Makes

A comprehensive adequate wiring program for apartment houses and commercial buildings in metropolitan New York City will be unveiled by Consolidated Edison Co at a pair of meetings in the Waldorf-Astoria Hotel this week. In attendance tomorrow (Dec. 1) will be 200 persons representing 77 architectural firms, 38 consulting engineering organizations, and seven manufacturers. On Wednesday another 200 persons representing 82 real estate firms and 46 insurance companies and savings banks will be on hand. They will:

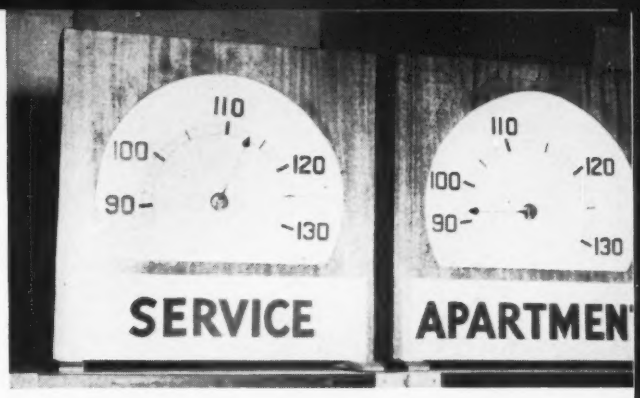
- See a skit dramatizing how the voltage drops as more and more appliances are placed into operation in an inadequately wired apartment.
- Hear J. C. Murtha, manager of the utility's Sales Engineering Bureau, comment on the skit and suggest what might be done to deal with such problems.
- Hear Joseph Covington outline the aims of Con Ed's Adequate Wiring Bureau, set up last month, which he will manage.

Harmful By-Play . . . The skit is a typical domestic scene involving one of the 74% of New York families living in apartments. The customary apartment facilities are supplemented at the side of the set by two voltmeters (see top of page) which measure the voltages at the point of termination of company service and that available at the fuse cutout.

At first the refrigerator, then the broiler, lights, television, coffeemaker, and toaster are turned on, the dropping voltage at which the appliances are forced to operate registers on the apartment voltmeter. Finally, the whole electrical setup conks out as Mr Knickerbocker flips on the ¾-ton

Badly Jolted . . .

. . . was the voltage by this turn of events. Moral: Sam, you made the wires too small



. . . Then current went out, causing undomestic bout

a Play for Adequate Wiring

aid conditioner, precipitating a domestic spat, complete with the traditional "home-to-mother" threats.

Similar Problem . . . Speaking with the aid of charts, Murtha will tell his audiences that the problem is just as prevalent in office buildings, where increased use of air conditioning, and office machines and higher lighting intensities are causing a "tremendous increase in the demand for electricity."

To combat the twofold problem, Murtha will outline what should be done to adequately wire new office buildings and apartment buildings. As for existing buildings of all types, he will advise that additional capacity can usually be obtained by replacing rubber covered risers with modern thinwall thermoplastic because:

- It occupies less space.
- The code permits 50% conduit occupancy on rewiring as against only 40% on new wiring.
- It saves the cost of additional conduit.

Bureau Outlined . . . Covington will say that the Adequate Wiring Bureau, in the thought stage since last spring, will try to impress people such as those at the meetings this week with the need for more substantial wiring systems than have been used heretofore.

This will be done by providing statistical data on current usages of various appliances, and by individual building surveys conducted by Con Ed's adequate wiring specialists. The specialists will tell landlords and other building management people what electrical equipment, such as room air conditioners, to make plans for in designing new wiring or in supplementing existing wiring.

System operator of Long Island Lighting works . . .

System Centers Its Operations

J. L. DAVIDSON, Electric Planning Engineer,

J. R. GUMMERSALL, System Operations Engineer,
Long Island Lighting Co, Mineola, L. I.

A modern system control center—underground and semi-bombproof—is now being operated by Long Island Lighting Co. The new center is located at the new Hicksville, N. Y., operating headquarters. It enables operators to maintain constant control of major generating stations and substations and to monitor power facilities of the system and its interconnections.

The control room, on the lowest-level of a three-floor building, has no outside windows. Semi-bombproof construction was used because of the nearby location of strategic air raid targets. Specially protected telephone circuits radiate from the control room to all power plants, substations, and a remote emergency service headquarters to provide the basis of load dispatching and system control.

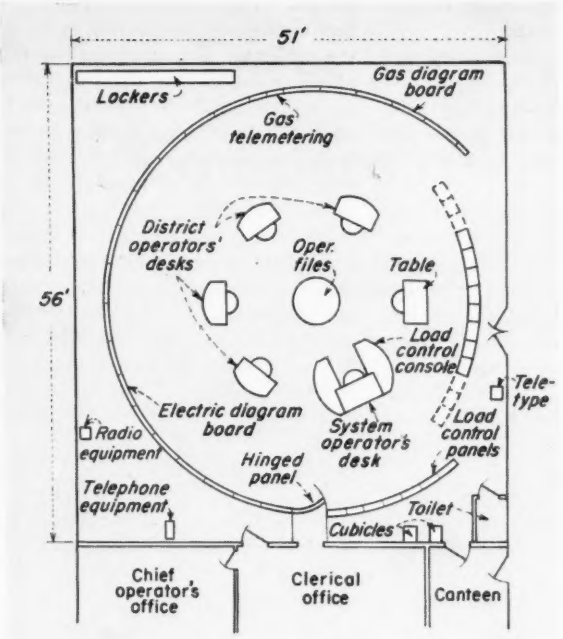
Guided by a diagram board of the electric and natural gas systems, system operators also have four control functions available to them:

- Supervisory control of remote substations.
- Automatic load control of power plants and interconnections with neighboring utilities.
- Telemetering of remote quantities.
- Communication with power plants, substations, and mobile radio units by means of private telephone lines and space radio.

Within the 50 by 55-ft control center, equipment and diagram boards are arranged in a circular pattern. Operator's desks are spaced in a circle near the center of the room. The chief system operator and the clerical staff have offices adjoining the control room. An adjacent canteen can provide light meals during emergencies.

Dispatching Diagram Board . . . Main diagram board for the electric system is a 68-ft, continuous-curved surface of perforated aluminum panels, 11 ft high. It is finished with a dull, bluish lacquer known as "load dispatcher's green." A final coat of matte clear lacquer reduces glare. The diagram is applied with quickly movable, colored, adhesive-backed tapes. Painted brass pins, inserted in panel perforations, show switch positions. Signal lights to provide instantaneous status indication for all equipment under supervisory control will be added.

Supervisory Control Equipment . . . Up to 40 major substations can be



Control Center Features

Underground—Semi bomb-proof construction avoids distractions
Circular pattern—All equipment readily visible
Canteen and adjacent washroom
Diagram board—perforated design with colored tapes
Supervisory control equipment controls 17 remote substations
Automatic load control equipment controls economy loading of all major generating stations
Weather instruments and direct wire to U. S. Weather Bureau assist in load dispatching
Communications via special telephone circuits and space radio
Special lighting for vertical boards
Fireproof construction
Air conditioning and sound proofing
Pin boards for substation details
Alternate power supply plus emergency diesel driven generator
Grid system of underfloor ducts permits changes to be made readily.

in circular control room . . . **which has these features**

in New Underground Control Room

operated from the control center by supervisory equipment. There are 17 stations under control or authorized. Supervisory equipment for each operates over a single pair of leased telephone wires to:

- Control oil circuit breakers.
- Control disconnect switches.
- Control transformer tap changers.
- Telemeter remote voltage and current values.
- Facilitate synchronizing across remote breakers.
- Show position of remote equipment.
- Report various alarm functions at remote stations.

Alarm points include low voltage, loss of control power, lockout conditions on automatic reclosing circuits, loss of compressed air at breakers, operation of differential auxiliary relays, and malfunctioning of oil pumping system associated with remote pipe-type cable installations.

Automatic Load Control . . . One operator at the center can automatically control output of all major generating stations. He can schedule the rate and proportion of any system load change among them.

Equipment at the center records and totalizes the total output of each power station and compares this total with the non-scheduled flow of the interconnection. Actual telemetering from remote plants and from the interconnection substation is performed by pulses transmitted over leased telephone lines.

Non-scheduled flow over the interconnection is the basic quantity which determines whether there is an excess or deficiency of generation on the system at any moment. This quantity triggers control impulses to the governor motors at the plants to bring power flow of the interconnection back to its scheduled value.

Selector dials at the center can make all changes fall on one station. Or all can be made to share load changes in any proportion as dictated by system economy loading conditions. All equipment is under direct supervision of the system operator.

Five power stations and the interconnection are now totalized by means of telemetering recorders. Provision for four more stations is provided. System frequency and 66-kv voltage are telemetered from the Newbridge Road Substation, a major substation in the center of this rapidly expanding system.

Although normally the entire load control equipment is automatic, the system operator can raise or lower the output of any station by hand control. If a serious system disturbance occurs, automatic controls are tripped off, and each station operates alone. Power station operators can supersede all automatic control functions at any time.

Weather Instrumentation . . . Local weather information appears on the same panels with load control equipment. General weather information and forecasts are received from the U. S. Weather Bureau via teletype. The system operator uses all this information in his work. Because the underground location prevents a view of local weather conditions, an illuminometer has been installed to measure and record daylight intensity. It also indicates an early twilight which may result in early peak load conditions.

Communications . . . The system operator and district operators are in constant touch with all power plants and major substations and have radio contact with mobile units elsewhere. Normal communications with fixed sites are by private telephone lines, but radio backs up communications with these features:

- Nine main transmitting stations cover all of Long Island.
- All power plant sites are equipped with transmitting stations.
- There are approximately 190 radio-equipped cars and trucks for emergency service restoration and for construction work.

All control center operators have identical telephone turrets which receive all calls coming into operating headquarters. Five outside circuits go to Hicksville central and five connect with the building switchboard. There are also private lines to system sites and to Consolidated Edison Co, Transcontinental Gas Pipe Line Co, Long Island RR, U. S. Weather Bureau and the police department.

A double dictaphone system in each desk can record both outside and inside telephone conversations. A radio speaker and handset at each desk are connected with the Hicksville radio transmitter shared jointly by the control center and the service group in the building. This transmitter covers all fixed stations and the majority of the mobile units. Telephone links to other transmitters are planned so that Hicksville headquarters will have direct contact with all mobile units on the entire system.

Other communications equipment is mounted in a radio rack behind the diagram board. It consists of a special weather radio and a receiver to monitor Consolidated Edison radio calls. A monitor speaker for the Con Edison receiver is mounted on the system operator's desk.

Light and Power . . . Recessed lighting in the acoustic tiled ceiling provides 65 ft-c at the working desk surface. Even illumination of the entire diagram board surface is provided by special fixtures near the top.

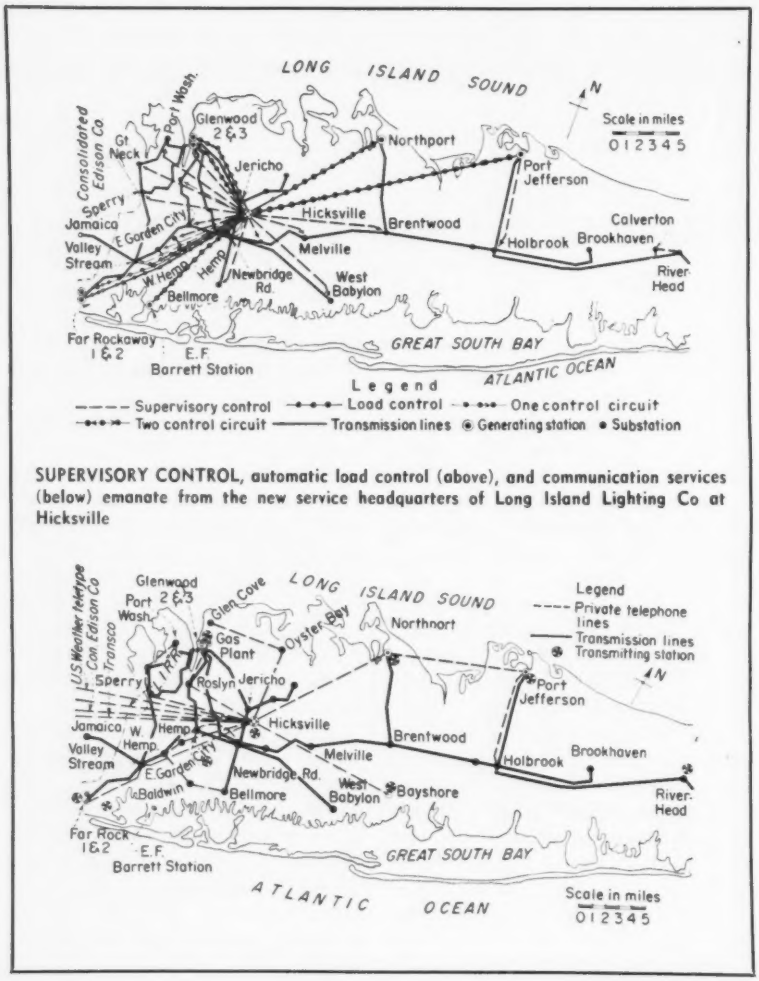
The service building gets power from two 13.2-kv circuits, each from a different substation but with a bus tie between them. Normally the building is connected to one source with the bus tie open. If the source fails, the bus tie closes and transfers the building to the other source. Red and green lights on the panel before the system operator show the position of the two incoming circuit breakers and the bus tie.

Other emergency supply features are:

- A 156-kva diesel generator which starts automatically upon loss of both normal sources and picks up all low voltage essential load in approximately 20 seconds.
- Emergency dc lighting in case of complete loss of ac power.

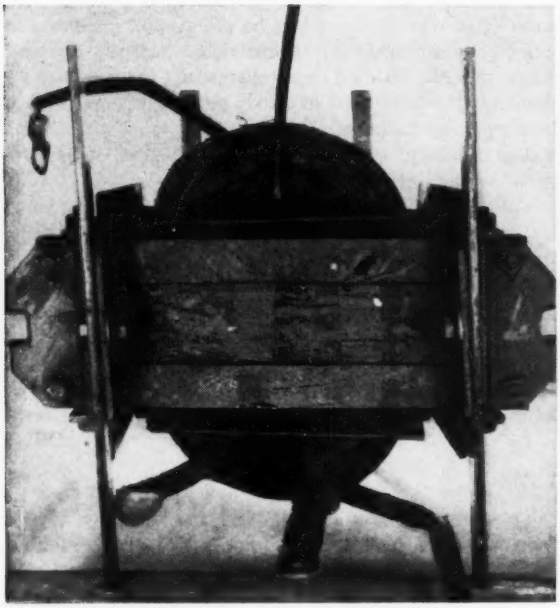
Features of Service Building . . . The Service Building in which the control center is located is one of six buildings now occupying the Hicksville site. Several additional ones have been planned. Sharing the lowest floor are the boiler room, a kitchen, and sleeping quarters. Other vital facilities, such as radio receivers and telephone switchboard, are located also on this lower floor.

On the first floor are facilities for emergency service operations as well as for normal construction and maintenance operations. In one room there are 40 emergency telephone stations. The second floor now houses on a temporary basis the mapping and management groups.

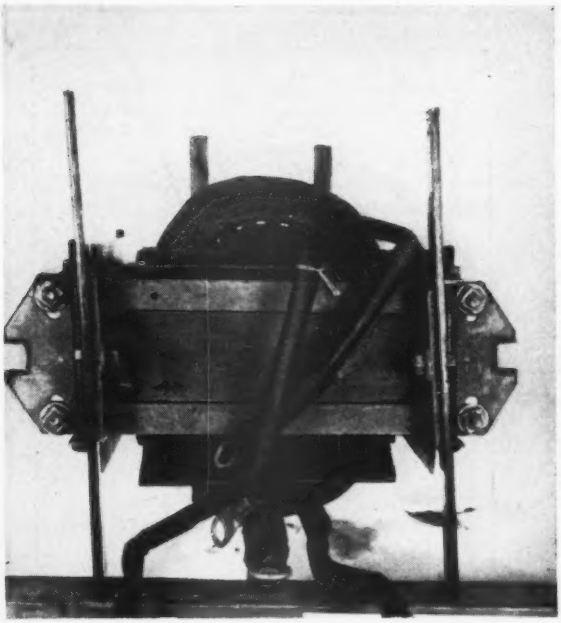


SUPERVISORY CONTROL, automatic load control (above), and communication services (below) emanate from the new service headquarters of Long Island Lighting Co at Hicksville

Aging Tests Compare Transformer Oil Performance



SLUDGE ACCUMULATION was severe in transformers containing reclaimed oils. No oil ducts remained open in these transformers



NEGLIGIBLE SLUDGE contamination occurred in Transformer 1 during year heat run with new inhibited oil. Ducts stayed open

L. B. SCHOFIELD, Materials Engineer,

F. T. CARVER, Engineer, Testing Dept. Commonwealth Edison Company, Chicago

Investigation shows no financial advantage under Chicago conditions in reclaiming and inhibiting old transformer oil. The results confirm tests previously reported by Halperin and Adler of Commonwealth Edison Co for inhibited oil in old breather-type transformers. The new tests indicate that inhibited oil:

1 Tends to slow up sludge formation in transformers.

2 Minimizes the danger of excessive temperatures from increased loads.

Used oil carried to a moderate degree of re-refinement with fuller's earth, 30 dynes, and inhibited with 0.3% DBPC (di-tertiary-butyl-paracresol) has about the same resistance to oxidation as is expected of a new conventional, non-inhibited oil. It would have an equivalent anticipated service life.

Accelerated aging tests were conducted to compare the relative merits of re-refined transformer oil when treated with DBPC and used as a replacement oil in transformers with those of new oil treated with DBPC. The tests indicated that new inhibited oil would have a much better service life. Superiority was first demonstrated by accelerated laboratory oxidation tests, Table I. For example, new inhibited oil ran 150 days on the proposed ASTM Transformer Oil Oxidation Test (TOOT), which was 10 times the life of used oil refined to 30 dynes with Fuller's earth and inhibited with 0.6% DBPC.

New oils with 0.3% DBPC inhibitor added also showed greater resistance to oxidation in:

1 Heat aging tests on oils in transformers;

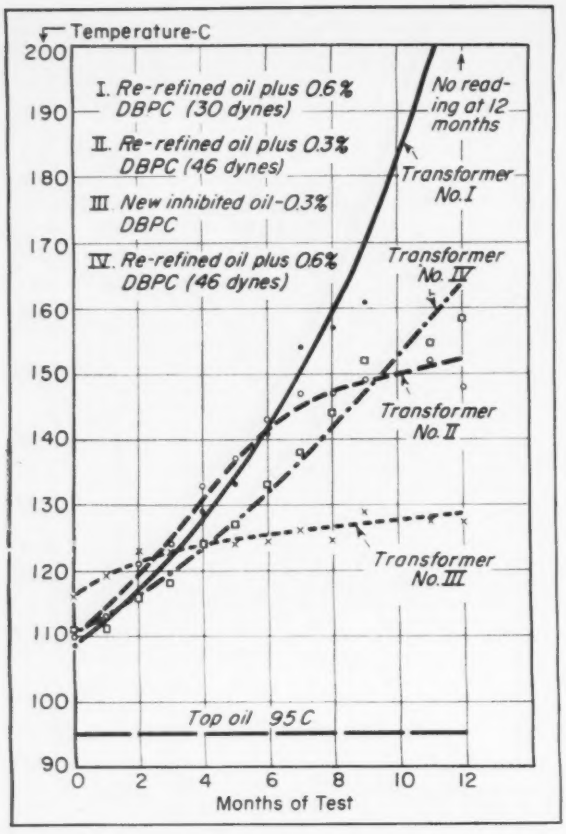
2 Supplementary heat runs;

3 Observations of copper temperature rises.

Temperature curves (Next page) show that poor heat dissipation and excessive temperatures are directly tied in with the degree of sludging.

Oils For Test . . . One barrel of oil of selected type inhibited at the refinery with 0.3% DBPC was used as the control.

Approximately 200 gal of used oil was taken from a large conservator-type transformer on the system. The age, source, and make of this oil was known, and its serviceability at the acquired date could be classified as fair or intermediate, i.e. approaching a state that would



TRANSFORMER COPPER TEMPERATURES reflect effect of sludging. Compare flat curve for new inhibited oil with those for inhibited re-refined oils. Failure of Transformer 1 was caused by clogged ducts

require reclamation or replacement with new oil. Appropriate quantities of this oil were re-refined to approximately 30 dynes, 40 dynes, and 45 dynes per cm respectively, using the Interfacial Tension test, ASTM - D - 971-50, as a criterion of degree of refinement. Refining was done by the absorption method in a laboratory model filter using fuller's earth for one batch and activated alumina for another.

Following these treatments, DBPC was added in various percentages to different parcels of these re-refined oils. A total of 22 different sample oils, listed in Table I, was made available for the tests.

Oxidation resistance was evaluated by two methods:

1 An accelerated laboratory oxidation test on all of the sample oils.

2 A simulated service aging test on four of the oils in transformers.

Accelerated Oxidation Tests . . . Results of accelerated oxidation tests in terms of days' "life" on this test for the various oils are shown in Table I. The TOOT life of 150 days attained by the new inhibited oil, containing 0.3% DBPC, is double that of the best reclaimed oil with comparable inhibitor content and ten times the life of the oil re-refined by fuller's earth to an IFT of 30 dynes with 0.6% DBPC added. Other comparative evaluations are evident in the test data. This test indicates relative propensities to oxidation or sludging.

Oil Aging Test . . . The oil aging test setup consisted of four 10-kva 2,170-120/240-v distribution transformers which had been in service for about 20 years. All were of the same make and approximate date of manufacture. The four transformers were reconditioned, prior to test, by removing the core and coils from the case for cleaning and flushing with clean oil. All had been contaminated in previous service with a moderate amount of soft sludge. Accessible oil circulating ducts were cleaned by rodding with smooth wood rods, before flushing with the clean oil.

A small amount of sludge remained on the core and coils. This was considered to be the general condition in an old power transformer at the time of oil replacement. After the old oil had been discarded, the tanks were thoroughly cleaned inside and out; and new lead-in bushings were installed.

The transformers were then filled with four of the prepared sample oils as follows:

Trans 1—Oil No. 5, Table I—Used oil "A" re-refined to IFT of 30 dynes/cm and 0.6% DBPC added.

Trans 2—Oil No. 10, Table I—Used oil "A" re-refined to IFT of 46 dynes/cm and 0.3% DBPC added.

Trans 3—Oil No. 22, Table I—New inhibited oil "C" from company stock, containing 0.3% DBPC.

Trans 4—Oil No. 11, Table I—Used oil "A" re-refined to IFT of 46 dynes/cm and 0.6% DBPC added.

All re-refining of above oils was by fuller's earth.

Transformers were operated for the aging tests at a constant top-oil temperature of 95C, except for a 16-hour cooling period once each week to produce a breathing action. Covers were placed loosely on top of the cases without being bolted down, which allowed restricted access of air to simulate operating conditions of unprotected transformers. The four transformers were enclosed in a Celotex box 28 in. wide, 38 in. deep, and 8 ft. long, to maintain more stable ambient temperature.

Heating was produced by connecting the high-voltage winding to a power source with the low-voltage winding short circuited. Circulating current in each transformer was regulated individually to maintain a top-oil temperature of 95C regardless of degrees of sludging. Slight adjustments were necessary to compensate for seasonal changes in ambient temperature. Average copper and top-oil temperatures in each transformer were measured periodically. Copper temperatures were obtained by measurements of copper resistance.

Oil samples were taken from the transformers at the beginning of the heat aging tests, after 6 months, and after one year for tests to indicate the comparative degrees of deterioration. The heat aging treatment was discontinued after one year because of the very rapid rate of decline in all of the reclaimed oils. The advanced stage of degradation attained in two oils was such that they would not normally be considered serviceable.

The maximum acid number permitted for oil in service is 0.6 and the maximum sludge content tolerated is 0.015% by weight, in accordance with regular maintenance procedures currently practiced on this system. Data of the oil tests are shown in Table II.

Refining of old oil to an IFT of 46 dynes per cm is generally considered well beyond the limits of economical practice. In those companies where reclaiming procedures

are regularly used, re-refining to a maximum IFT of 30 to 35 dynes is generally favored. Therefore, of all the reclaimed oils on test, greatest interest lies in the 30 dyne oil.

Heat Runs . . . Before starting the aging tests and at termination after one year, all of the transformers were subjected to a heat run at rated current to measure temperature rises. These temperatures were obtained in accordance with standard temperature test by the opposition method in accordance with ASA Standard C 57.22.100(d).

Two transformers broke down on the final heat runs. This indicates the serious effect of reclaimed oil degradation on serviceability of transformers. The high voltage and low voltage windings on Transformer II, containing the reclaimed oil with 0.3% of DBPC, showed ultimate temperature rises of 94C and 71C, respectively. These copper rises were substantially greater than the 64C and 53C noted in Transformer 3 with new inhibited oil.

Table I . . . Accelerated oxidation tests oil life

Sample No.	Description	DBPC, % by Wt.	Life-Days**
1	Used oil A as received—IFT of 18.1 dynes	0	1/3
2	Same with inhibitor added	0.6	16
3	Used oil A—Re-refined with fuller's earth to IFT of 30 dynes	0	3/4
4	Same with inhibitor added	0.3	9
5	Same with inhibitor added	0.6	15
6	Used yil A—Re-refined with fuller's earth to IFT of 40 dynes	0	4
7	Same with inhibitor added	0.3	27
8	Same with inhibitor added	0.6	43
9	Used oil A—Re-refined with fuller's earth to IFT of 46 dynes	0	3
10	Same with inhibitor added	0.3	43
11	Same with inhibitor added	0.6	69
12	Used oil A—Re-refined with activated alumina to IFT of 30 dynes	0	2
13	Same with inhibitor added	0.3	44
14	Same with inhibitor added	0.6	71
15	Used oil A—Re-refined with activated alumina to IFT of 45 dynes	0	10
16	Same with inhibitor added	0.3	75
17	Same with inhibitor added	0.6	89
18	Used oil B as received—IFT of 27 dynes	0	2
19	Same with inhibitor added	0.3	24
20	Same with inhibitor added	0.6	37
21	Same with inhibitor added	0.9	52
22	New inhibited oil C—IFT of 50 dynes	0.3	150

** By Transformer Oil Oxidation Test based upon turbine oil oxidation test by ASTM Method D943-47T.

Table II . . . Heat-aging tests in transformers changes oil characteristics

Transf. No.	Oil in transformer	Color number			Acidity (Mg KOH)			Sludge (% by Wt.)		
		Original	6 mos.	1 yr.	Original	6 mos.	1 yr.	Original	6 mos.	1 yr.
1	Re-refined to 30 dynes (0.6% DBPC)	3.5	6.5	8	0.10	0.76	1.02	0	0.070	0.160
2	Re-refined to 46 dynes (0.3% DBPC)	1.5	5	6	0.005	0.89	1.08	0	0.082	0.130
3	New inhibited oil (0.3% DBPC)	0.75	3	3.25	0.01	0.63	0.71	0	0.014	0.030
4	Re-refined to 46 dynes (0.6% DBPC)	1.5	5	6.5	0.005	0.70	0.94	0	0.027	0.080

Color No. determined by ASTM Standard Method D-155 (Union Colorimeter).
Acidity determined by ASTM Tentative Method D-974-51T (Color-indicator titration).
Sludge measured by procedure in Sections 26, 27 and 28 of ASTM Tentative Method D-670-42T.

Table III . . . Heat run tests re-refined oil for serviceability in transformers

Transf. No.	Transformer oil	Temperature rise at rated load—C*					
		H-v winding		L-v winding		Top oil	
		Original	1 Yr.	Original	1 Yr.	Original	1 Yr.
1	Re-refined to 30 dynes + 0.6% DBPC	41	**	39	**	30	**
2	Re-refined to 46 dynes + 0.3% DBPC	45	94	42	71	31	38
3	New inhibited oil (0.3% DBPC)	48	64	42	53	31	34
4	Re-refined to 46 dynes + 0.6% DBPC	43	**	40	**	31	**

* Ambient was normal room temperature.
Maximum rise allowed by AIEE Standards is 55C for new transformers.
** Transformer broke down on final heatrun.

Cooling Pond Data

Average water depth	10 ft
Slope-inside face of dike	3:1
Berm-inside face of dike	10 ft
Slope-outside face dike	2.5:1
Earth baffle length	3000 ft
Land Area	1.00 sq mi
Cooling Surface	0.85 sq mi
Earth dike	15 ft by 15 ft

For Mississippi P&L . . .

A Cooling Pond Proves Cheaper

A cooling pond instead of a cooling tower will serve the latest power plant of Mississippi Power & Light Co. The pond won out when an economic study was made during the early design stages of the 210,000-kw outdoor Delta Station, near Cleveland, Miss. An outdoor lake has since been constructed to provide condenser cooling water.

The station is located in the heart of the Mississippi River delta, adjacent to the Sunflower River which drains northeast Mississippi. The river, supplemented by deep wells, provided the initial fill and will supply make-up for the pond.

Three Methods . . . Three methods were proposed:

R. W. BRASWELL, Vice President and Operating Manager, Mississippi Power & Light Co, Jackson, Miss.

1 Use of river water for direct condensing with upstream recirculation as required.

2 Cooling pond.

3 Cooling towers.

The first method was not investigated too thoroughly since it was found during the early investigations that procurement of rights and permissions over the rich farm land would entail excessive costs and consume too much time; therefore, the study was then limited to the other two methods or to the use of a cooling pond versus cooling towers.

Cooling Tower . . . No extensive description of the cooling tower type of installation will be undertaken here. The towers would be of the conventional large induced draft design as presently being installed in power plants throughout the country and in use at Mississippi Power & Light's existing Rex Brown Station near Jackson and Natchez steam electric station near Natchez, Miss.

Advantages of Pond . . . Of course, the most important aspect of these studies was the comparative costs which indicated that initial construction costs of a cooling pond would be approximately 10% less than the towers. In addition to this saving the cooling pond offered advantages such as:

1 Cooling capability adequate for four units. With installation of additional units the economic advantage would still be greater when compared with towers.

2 Lower maintenance costs.

3 Probability of a longer life for the pools.

Also estimates of annual operating expenses indicated a saving of up to 2% in favor of the cooling pond. These approximate figures are shown in the attached tables.

Baffle and Dikes . . . A dividing earth baffle, approximately 3,000 ft long and extending out into the pond from the plant side, will provide good utilization of available pond area for evaporative cooling. Intake and discharge between the plant and the pond are on opposite sides of this baffle.

Approximately 900,000 cu yd of fill was borrowed from inside the pond area to construct dikes and the baffle. The slopes were seeded by airplane with rye and bermuda grasses for soil stabilization and prevention of erosion. In addition after filling of the pond had begun, it was found that wave action was causing more than normal erosion so 4 in. of asphalt surfacing was applied on the inside face of the dike.

Make-Up . . . Make-up was supplied from the Sunflower River, supplemented by deepwell pumps, by two 7.2 cfs vertical pumps, with provision for a third river pump on installation of future units. Seepage loss has been estimated at 2 cfs with the natural 9-ft average clay bed under the reservoir. Maximum forced evaporation for 4 units has been estimated at 9 cfs, thus giving a total of 11 cfs maximum make-up requirements.

Natural evaporation is disregarded because annual rainfall will balance this out over a year's period. Careful studies were made to determine the effect of the pond make-up requirements on the Sunflower River flow, and, consequently, effect on riparian rights of land owners. The results of these studies indicate the worst effect which would be caused by a 4-unit plant would be a lowering of the river at the plant site of approximately 2.25 in. or less.

The construction progress and costs to date indicate that design studies and estimates were approximately correct and the effectiveness of the arrangement will be entirely satisfactory. With these facts in mind, the construction of the cooling pond was authorized for the Delta Station. While actual operating experience is not available, it is believed that the decision will prove to be a wise one. The pond as constructed, on a square mile of land, contains approximately 0.85 sq mi of cooling surface surrounded by an earth dike 15 ft wide on top and 15 ft high which permits an average water depth above grade in the pond of 10 ft. The inside face of the dike has a 3 to 1 slope with a 10 ft berm, and the outside has a 2.5 to 1 slope.

It cannot be assumed that companies operating in other sections of the country will find it advantageous to install cooling ponds instead of towers. Local conditions vary too much.

Table I—Approximate Estimate for Condensing-Water Works

Cooling Pond

Condensing-Water System		
Sunflower River Intake and Supply Lines		$123,000
Intake structure for 25-ft flood crest	$50,000	
Two 15-cfs vertical pumps, 200-hp	40,000	
24-in. steel piping, 2500 ft	32,000	
Pile supports for piping	1,000	
Cooling Pond		332,000
Clearing and grading	2,000	
Earth dike, 900,000 cu yd at 30¢	270,000	
Creosoted dividing wall, 3500 ft	55,000	
Drain line and valve	5,000	
Intake Structure at Pond		50,000
Two-unit intake, about 45 × 35 ft and 25 ft high, with screens		
Intake and Discharge Conduits		195,000
90-in. reinforced-concrete pipe, $95 per ft		
Concrete Seal Well		10,000
Intake and Discharge Aprons		57,000
Piling	7,000	
Concrete mat	23,000	
Concrete separating well	6,000	
Riprap	21,000	
Accessory Electrical Equipment		163,000
Switchgear, for six motors	33,000	
Wiring, ducts, poles	130,000	
Direct Cost		930,000
Indirect and Overhead Construction Costs		285,000
Total Construction Cost		1,215,000
Land, MPL Overhead, Interest		265,000
		$1,480,000

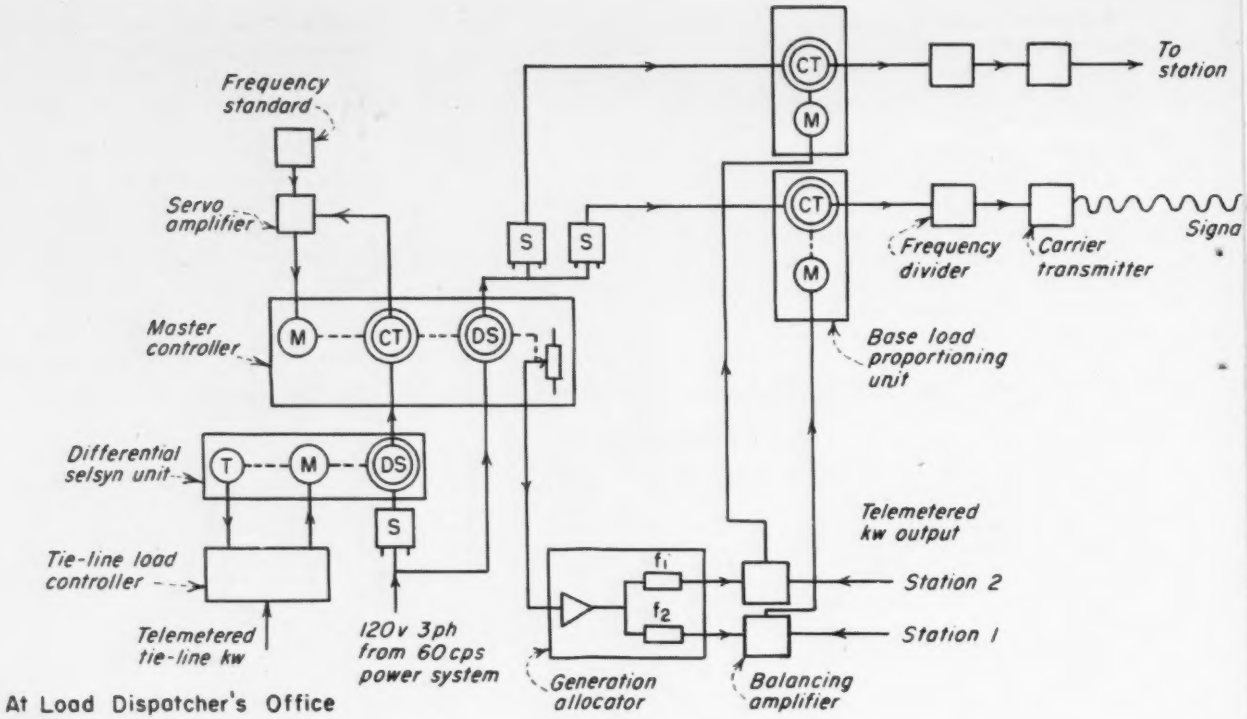
Cooling Towers

Condensing-Water System		$1,039,000
Sunflower River Intake, Pumps and Piping	$164,000	
Cooling-Tower and Motors, Fire Protection Piping	633,000	
Cooling-Tower Basin	102,000	
Cooling-Tower Intake and Screens	15,000	
Intake and Discharge Conduits	125,000	
90-in reinforced concrete pipe, $105 per ft		
Accessory Electrical Equipment		204,000
Switchgear, for 38 motors	$78,000	
Wiring, ducts, poles	126,000	
Direct Cost		1,243,000
Indirect and Overhead Costs		377,000
Total Construction Cost		$1,620,000

Table II—Economic Comparison of Plans

Two 1450-Psig 1000-F Gas-Fired Units

	Cooling Towers	Cooling Pond
Estimated investment, condensing-water works, $	1,620,000	1,480,000
Fixed charges and taxes (15%), $	240,000	220,000
Economy, Btu per net kwhr	11,700	11,500
Fuel cost per net kwhr, mills	2.34	2.30
Annual fuel costs (800 kmwh), $	1,870,000	1,840,000
Annual fixed plus fuel costs, $	2,110,000	2,060,000
Differential, $	+50,000	base



Single Channel Controls

G. S. LUNGE, Electric Utility Engineering Section, General Electric Co, Schenectady, N. Y.

One frequency standard, one tie line load controller, and one master controller, all located in the central load dispatcher's office now permit him, with one narrow band continuous signal channel, to:

1. Control automatically system frequency, tie line power interchange, or both (i.e., tie line bias control with adjustable tie line load schedule and frequency bias settings).

2. Assign to each generating station a maneuvering point or base load, or let it be shifted automatically to permit incremental loading for maximum economy of production.

3. Alter percentage of load changes taken initially by each generating station.

4. Set upper and lower limits of automatic regulating range for each generating station.

Similar, but simpler, equipment at each generating station permits the station operator to:

1. Change maneuvering point or base load of each generator, or let the point be shifted automatically to permit incremental loading for maximum economy.

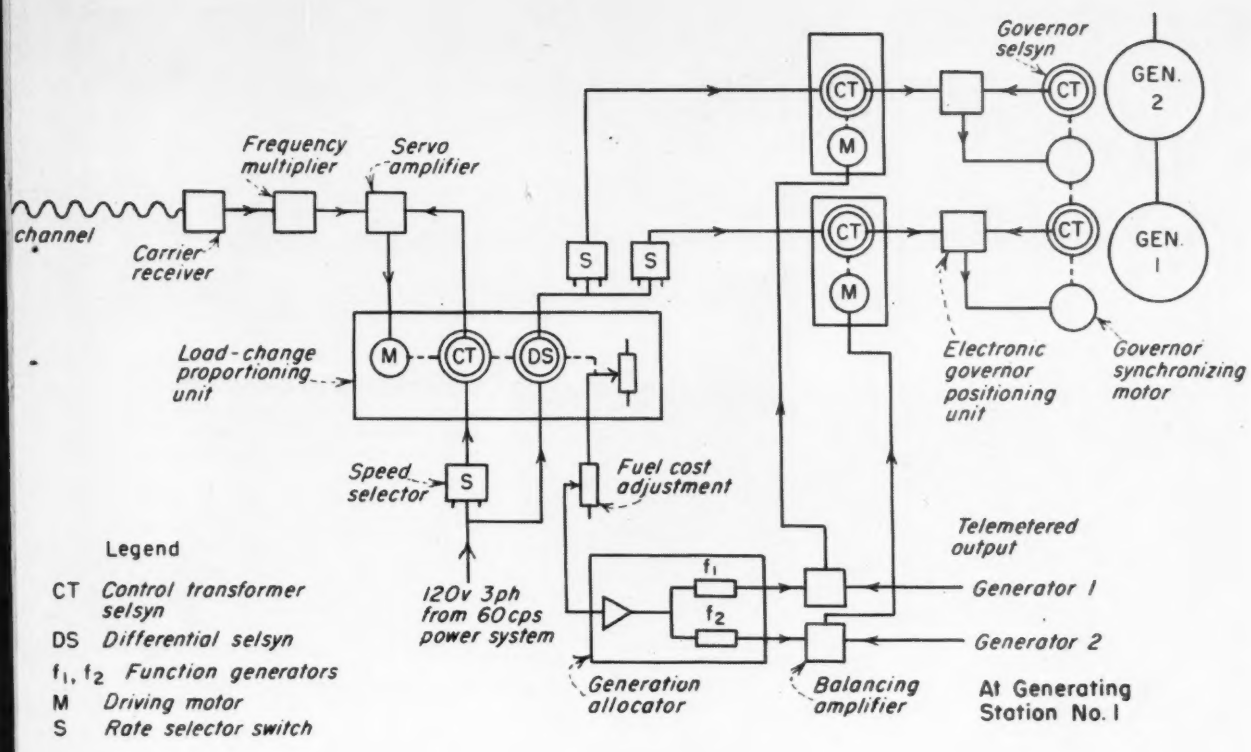
2. Alter percentage of load changes taken initially by each individual generator.

3. Set upper and lower limits of automatic regulating range of each generator.

Need for a separate frequency standard, tie line load controller, and master controller for automatic control in each station has been eliminated. And the differential selsyn now becomes the means of continuously comparing system frequency with a standard for system load and frequency control.

Built Up from Standard Assemblies . . . Standard components are all of compact design for rack mounting inside a console or carrier-current cabinet. Exception is the selsyn mounted on the turbine governor. It is geared to the synchronizing motor shaft so that the selsyn will make 30 revolutions when the speed level adjustment is changed from no-load to full-load position.

Essential components of the complete system are shown in the block diagram for two generators under remote control in each of two stations. At the load dispatcher's office, system frequency (nominally 60 cps) is compared with the tuning-fork-controlled frequency standard by a servo-amplifier. This unit causes the master controller shaft to run at a speed corresponding to the instantaneous



System Load and Frequency

frequency error if the tie line load is exactly on schedule.

Electronic tie-line load controller regulates the differential selsyn unit speed in direct proportion to any deviation from tie-line load schedule. This modifies the frequency with which the standard frequency is compared and thus alters the speed of the master controller shaft to provide tie-line bias operation. Choice of five output frequencies for different regulating rates is provided by a multiple differential selsyn.

Slow rotation of the master controller output shaft is transmitted faithfully to the generating station by an approximately 15-cps, single-phase control signal. This signal is obtained by a frequency divider from the 60-cps system frequency, changed slightly by rotation of the master controller output selsyn.

It permits continuous transmission over a narrow-band signal channel of:

1. Frequency-shift power line carrier.
2. Audio-tone channel.
3. Microwave radio.
4. Leased wire.

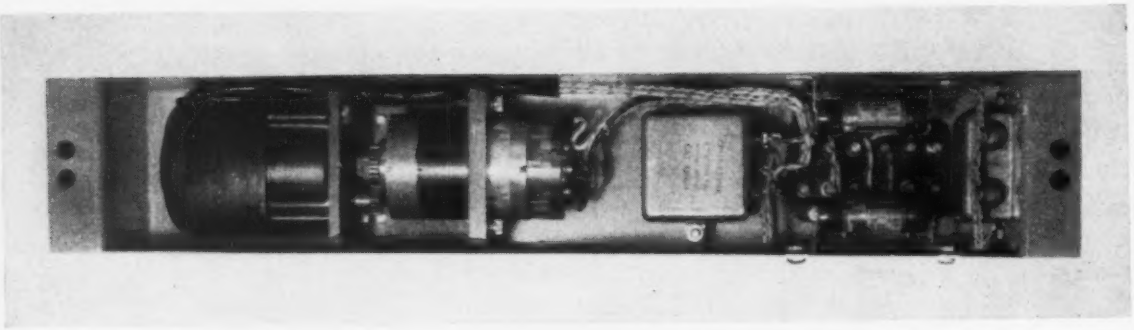
At the generating station the 15-cps signal is quadrupled by a frequency multiplier. The resultant is compared with power system frequency by the servo-amplifier unit to duplicate in the load-change proportioning unit the exact rotation speed of the load dispatcher's master controller.

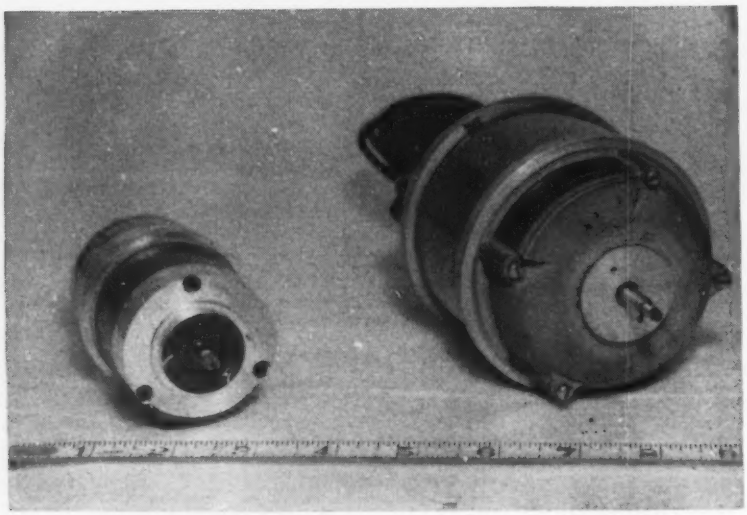
Selsyns on the governor of each controlled machine put out voltages which must be kept in phase with the load-change proportioning unit output. Deviations are detected by electronic positioning units which energize the ordinary governor synchronizing motors in the proper direction for sufficient time to restore phase agreement.

Controls Several Generating Stations . . . Two or more generating stations can be controlled from the load dispatcher's office. Base load proportioning units connected between the master controller and the signal link to each station enable the load dispatcher himself to change the maneuvering point (or base) load assigned. These units can also be the means for keeping the output of each station within a definite regulating range in kilowatts.

Control can be routed through one or more sub-dispatching offices, each equipped with a load-change proportioning unit identical to those in generating stations and base load proportioning units identical to those in the main dispatching office.

Automatic incremental loading of stations can be added. For this a slide-wire is geared to the master controller. Dc voltage from this slide-wire increases in





BASE LOAD PROPORTIONING UNIT, above, is typical of elements for single-channel control of system load and frequency. These strips mount in standard carrier cabinet

TWO SELSYNS for load-frequency control are miniature versions of original equipment used in early overseas installations. Ruler indicates size for current models

proportion to system load and is used as the input to a generation allocation unit. This unit contains an electronic function generator for each station the output of which is compared with the telemetered kilowatt output of the station by a balancing amplifier unit. Any difference causes the base load proportioning unit to change the station output slowly until the difference disappears completely.

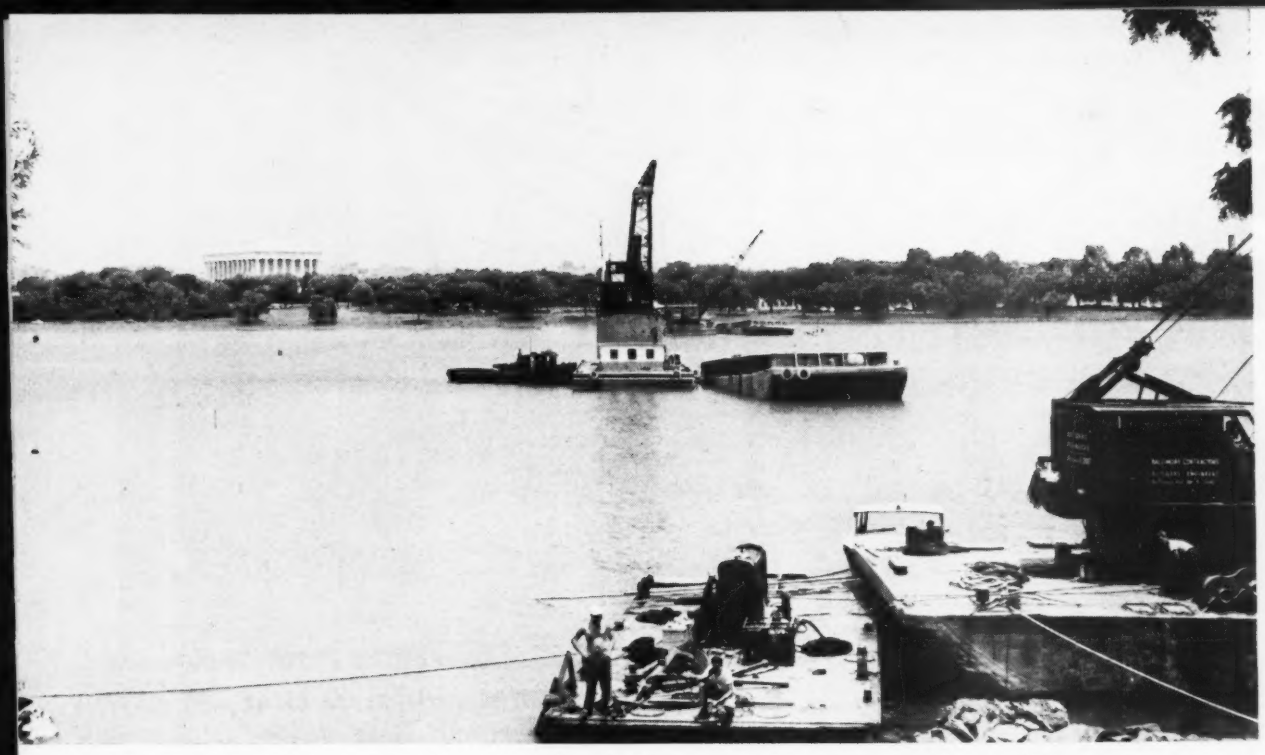
These function generators should be adjusted so that their output voltage will correspond to the correct load division between stations. Any difference in economy (incremental cost) between stations and transmission losses (penalty factors) can be factored in. Function generators will not require readjusting (unless penalty factors are included) except when the number of generating units or fuel costs change.

Similar equipment in each generating station allocates the maneuvering point or base load between individual generating units to make all controlled machines operate at equal incremental costs. The function generators are set in terms of Btu per kwhr. No change is necessary when the number of generators in service changes during the day. But the fuel-cost adjustment will require altering when the cost of fuel changes.

Outputs of all generators under control are automatically adjusted slowly to operate with equal incremental cost per kwhr. This condition is necessary for best system economy, except for transmission line losses which can be taken into account by occasional adjustments at the dispatcher's office. The master controller still corrects deviations from tie line schedule and from 60 cps promptly, but the final division of load between stations and between units will be established on an economic basis.

Modification Eliminates Dispatcher Adjustment . . . A still closer opproach to fully automatic operation is obtainable if the generation allocation equipment is omitted from the load dispatcher's office. Then only one control signal is sent simultaneously to all generating stations. This arrangement eliminates readjustments at the load dispatcher's office, requires them at the generating stations only when fuel cost changes. Optimum load division among the controlled machines is automatically calculated and executed on the basis of known machine and station economies, and also transmission loss penalty factors if such loss factors have been set into the equipment.

Base load proportioning units at the dispatcher's office in each station channel permit manually modifying the station signals to reflect transmission losses assignable to that station. They also provide centralized manual control of stations by the station load dispatcher in emergencies.



Removing spoil from trench and loading it into scows for transportation to disposal area

Pepco Lays 5 Cables . . .

Across the Potomac in 2 Hr, 40 Min

Weeks of planning and preparation make possible quick laying of line to increase power supply in Lincoln Memorial area

J. P. MORAN, General Foreman, Cable Division

H. W. DANNETTELL, Asst to the Supt, Distribution Dept
Potomac Electric Power Co, Washington 4, D. C.

Just 2 hr and 40 min were required last summer to lay five submarine cables under the Potomac River. Behind these relatively few minutes of action went days of preparation and weeks of planning by engineers of Potomac Electric Power Co.

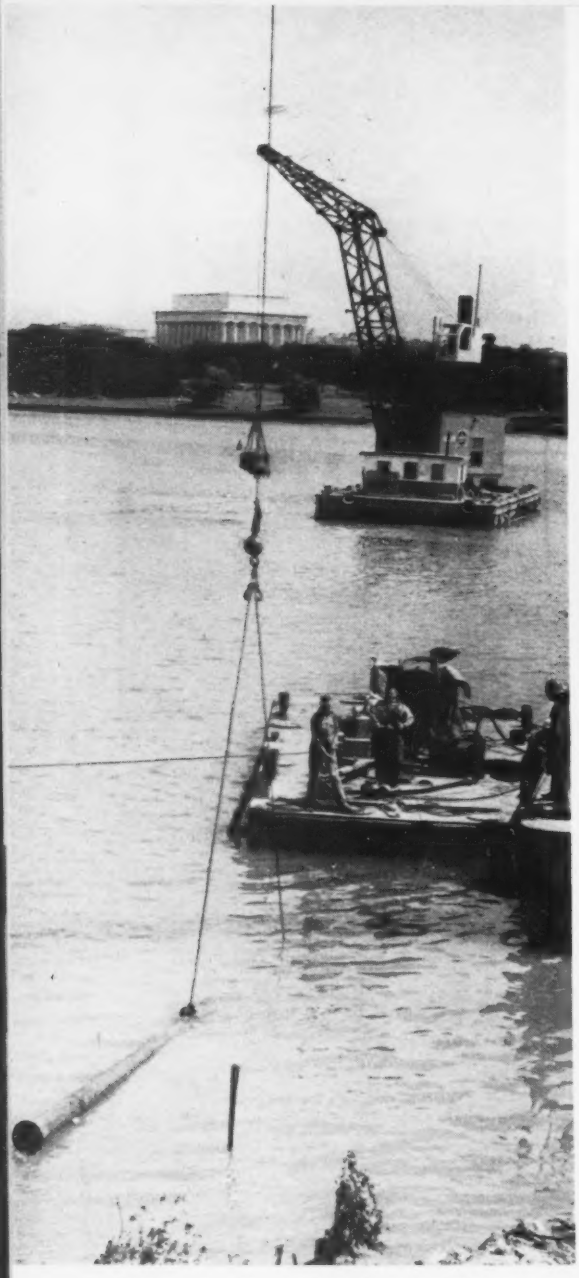
The cables were no midgets. They were 500,000 cir mils, 3-conductor, paper leaded, medium pressure gas filled, rated 45,000 kva at 69,000 v. Each was 2,150 ft long, 27 lb per ft, and 4.62-in. outside diameter.

The cable installation was a part of Pepco's system expansion program. The crossing in the vicinity of Arlington Memorial Bridge was dictated by the need for a step-down substation to increase power supply to government buildings in the Lincoln Memorial area. The circuits will provide getaway capacity for a 100,000-kw unit which will go on the line next spring at the Potomac River Station at Arlington, Va.

Planning . . . In the preliminary planning it was found that the size and weight of the reels required were entirely too large to be mounted on barges available in this locality. Because of this and the limited waterfront facilities in the Washington area for handling heavy equipment, the cable was shipped in by water. The cables were mounted at the manufacturer's plant on steel reels approximately 18.5 ft wide by 10 ft high and shipped by rail to Camden, N. J., where they were loaded on a flat deck steel barge (EW, Aug. 17, p43) and moved to Washington.

Trench Preparations . . . Prior to cable shipment, trench preparations were begun across the river. The river at this point is approximately 1,900 ft wide with an average depth of 15 ft and a navigable channel 25 ft deep.

Regulatory authorities required that the cables be laid to a minimum depth of 10 ft below the river bed. A trench 15 ft wide at the base with an estimated side slope of 3 to 1 was dug across the river. Where the trench was excavated through areas having more than 10 ft of water, it was necessary to load the spoil on mud scows. This spoil, approximately 26,000 cu yd in all, was hauled to a disposal



Lowering iron tube into position

Erecting cable pay-off supports on the barge

Pulling cable into east bank terminal manhole

area designated by the authorities. Spoil in areas having less than 10 ft of water was stockpiled alongside the trench for backfilling after laying the cables.

It was estimated that 30 days would be required for this phase of the project. The trench was completed on schedule by working two shifts per day on a five-day week basis plus a relatively small amount of overtime.

Seawall Protection . . . To insure adequate protection for the cables under the seawalls on both shores, wrought iron tubes 8 in. in diameter and 53 ft long were laid through the rock foundations supporting the seawalls. Before the trench was released for the installation of cable, the inspection authorities took depth soundings at intervals of 10 ft from shore to shore to insure compliance with the conditions of the permit.

Two Plans . . . For the crossing, two plans were considered. Plan A would have necessitated towing the cable barge with two tugboats, one lashed on each side of the barge, from temporary anchorage off the District of Columbia shore directly to a like position off the Virginia shore. Plan B called for pulling the cable barge across the river with a steel line from a power winch on a marine derrick anchored a reasonable distance from the cable barge.

Plan B was selected. Although this plan necessitated the installation of two additional anchoring points, it was well justified as it would afford a greater degree of accuracy in controlling the laying of the cables.

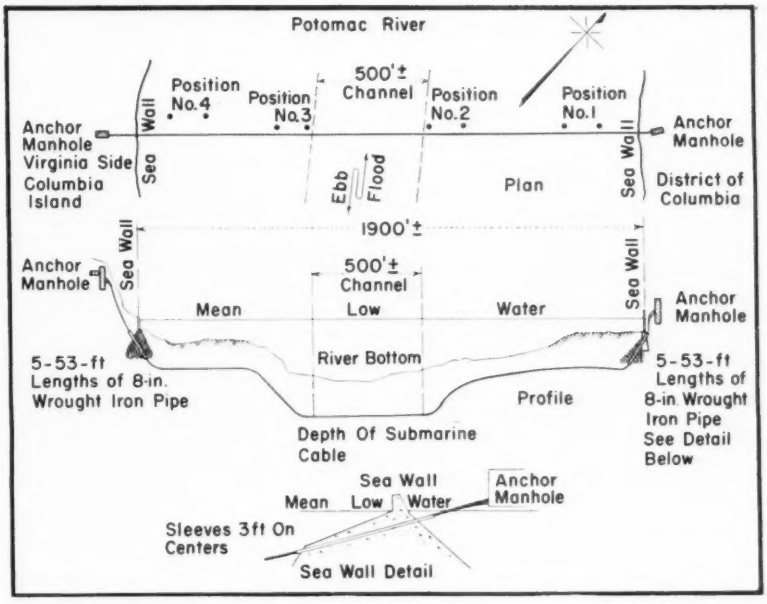
Cable Supports . . . When the cable barge arrived in Washington, D. C., work was begun by the Shops Division

to erect five H-frames forming a superstructure on the deck of the barge to provide a separate horizontal support for each of the five cables as they passed over and above the cable reels while being payed off the stern.

Installing Cable . . . At the beginning of the cable installation, the barge was anchored in position No. 1, about 100 ft off the District bank of the river. Each of the five cables was individually pulled from the barge by a winch on a land based rig through the 8-in. wrought iron tubes into the terminal manhole and temporarily anchored. A diver guided the cables into the tubes and inspected them to determine their relative position before the barge was moved.

Three Steps . . . It was planned to complete the cable laying in three steps. To accomplish this a marine derrick was placed on the Virginia side of the channel directly over the center line of the trench, and a ¾-in. steel cable from this derrick was attached to the bow of the cable barge. It was then steadily pulled by the derrick from position No. 1 to position No. 2, and temporarily anchored.

After obtaining clearance for the crossing of the channel from the harbor police, the barge was pulled to position No. 3, approximately 750 ft. As a precautionary measure while in the channel area, a tug was used to prevent any possible drifting or deviation from the course. The barge was temporarily tied up to piling at position No. 3 while the derrick was relocated at its final pulling location.

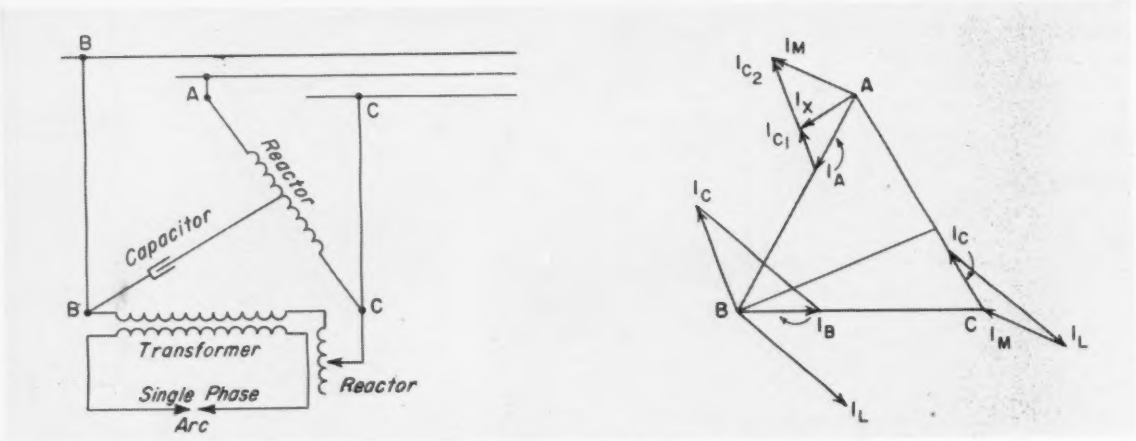


Final Pull . . . For the final pull the marine derrick was based near the Virginia shore, a sufficient distance down river from the trench to allow ample room for the barge to be moved into No. 4 position. To keep the barge on its course during pulling operations, the ¾-in. steel cable from the marine derrick to the barge was passed through a sheave block attached to the wall of the terminal manhole on the Virginia side. The barge was then pulled from No. 3 to No. 4 position, approximately 400 ft. By observing the angle at which the five cables entered the water and by applying braking tension when required, it was possible to maintain a uniform rate of slack feeding into the water. Actual crossing, i.e., from positions No. 1 to No. 4, took 2 hours and 40 minutes.

Dismantling Supports . . . With the cable barge in final position the cable roller pay-off mountings, used to support the cable above reels during the crossing, were dismantled. This facilitated removal of the cable remaining on the reels. With the aid of the derrick the cable on one reel, about 400 ft, was formed into a figure 8 on a flat top barge between the cable barge and derrick. This cable was then pulled through an 8-in. wrought iron tube into the manhole. The other cables were anchored similarly.

Pulling cable from figure-8 barge at west bank

Anchoring cable permanently



OSCILLOGRAPHS taken to determine surge current reveal that in this test distortion of oscillograph traces was not severe

Single-Phase Load Split on 3 Phases

B. W. SCHAFER, Manager, Detroit Electric Furnace Division, Kuhlman Electric Co, Bay City, Mich.

A single-phase indirect arc furnace at Engineering Castings Co, Marshall, Mich. is equipped with auxiliary equipment to spread the load on the three phases of the incoming service. This marks the first commercial installation of such a circuit in the United States.

While the single-phase indirect arc furnace has been used to melt bronze and alloy irons for some 34 years, this type furnace presents a problem to the utility serving the furnaces because of the unbalance created by the loading of but one phase of the service. Normal procedure has been to shift other single phase loads to the other phases to secure the best possible balance at the substation.

Experimental Circuit . . . In 1944, Kuhlman Electric conducted an experiment with a 60-lb, 30-kw indirect arc furnace to test the feasibility of a circuit previously theorized but never tried. This circuit utilizes a phasing reactor and capacitor to divide the low power factor (70% load of the arc furnace with the other two phases.

Calculations of the circuit forecast that at 38 kw (480-v primary) average primary current would be 58 amp. Actually at 50-kva input meter readings of 59, 58, and 66 amp were recorded. This contrasts with a normal single phase load of 114 amp without the auxiliary reactor and capacitor. These experiments were repeated in 1949. Results are tabulated in Table I.

Mobile Furnaces . . . Following the initial trial, equipment was designed and produced for the Corps of Engineers to be used with mobile foundry units during World War II. The furnaces were never used, and eventually one was installed by Engineering Castings to produce alloy iron for automotive parts. The power equipment was built to operate on 400-v, 50-cycle service and is now served by 500-v, 60-cycle service which gives similar electrical charactertistics.

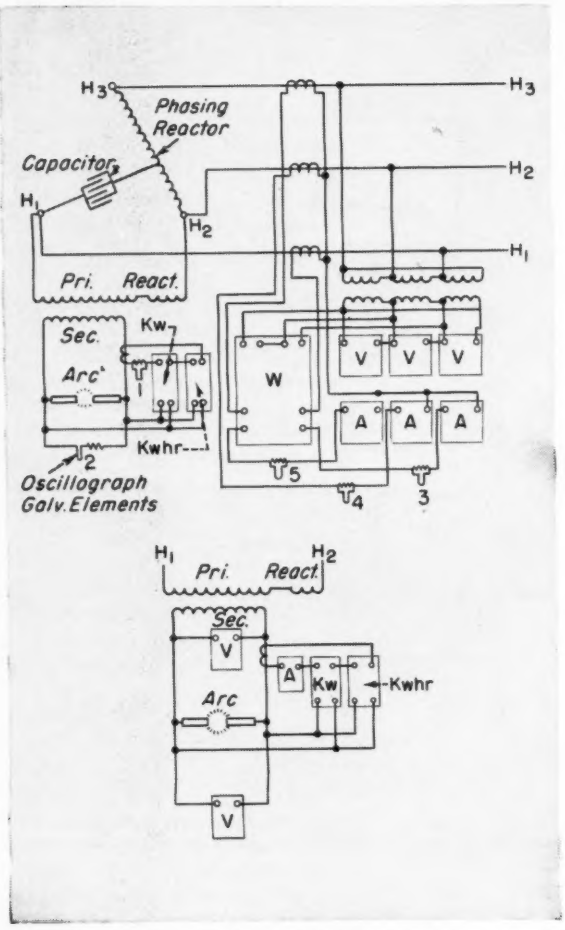
Meter Readings . . . Because the arc generates an unsteady load, it is difficult to obtain accurate meter readings either by recording or visually. However, measurements of secondary and primary voltage, amperes, and kilowatts were taken throughout one heat. Individual, simultaneous readings at various stages of a typical heat are recorded in Table II.

Oscillograph readings were taken of primary and secondary current. The wave shape was considerably distorted and accurate evaluation could not be made. This distortion is apparently due to resonance in the primary circuit in the nature of 107 cycles per sec. Distortion of secondary current waves is even more noticeable but has no bearing on the primary circuit.

Surge Current . . . Another problem which arises in the operation of arc furnaces is the surge or inrush current upon striking the arc. Indirect arc furnaces create a dead short of few cycles duration, limited only by the speed of burning of the electrode tips and circuit reactance.

To determine the magnitude of this surge current, oscillographs were taken. Distortion of oscillograph traces is not so severe in this test. Evaluation of several shots of secondary and primary currents are listed in Table III.

Power Factor . . . From the average primary currents in Table II, the load would be 141 kva, 3 phase. If this furnace were operated at 94 kw, single phase, we would also get a 141-kva load assuming a power factor of 67%. Thus, while no advantage is obtained by the balancing circuit from the power factor standpoint, the advantage of having the load on all three phases of the distribution system instead of on a single phase is apparent.



CONNECTION AND VECTOR DIAGRAMS show balancing single-phase load on a 3-phase line. Circuit utilizes a phasing reactor and capacitor to divide low power factor (70%) load of arc furnace with other two phases. This offers a solution to load balance problem

Table I—Results With 30-kw Experimental Furnace

Input to Furnace	Single-Phase Operation Volts	Amp	Kva	Three-Phase Operation Ave. Volts	Amp A	B	C	Ave.	Kva
35 kw	432	112	48.4	427	70	70	66	68.7	50.9
39 kw	416	132	54.9	427	78	68	80	75.3	55.8

Table II—Simultaneous Readings of Typical Heat

Kwhr	Volts	Amp	Kw	Pf	Volts Bal. 3-Phase	Amp H1	H2	H3	Ave.
0			90		500				
22.5	90	1330	94	0.79	500	172	96	176	148
39	65	1680	90	0.83	500	136	176	176	163
39	62	1760	89	0.82	500	140	188	176	168
53	78	1520	98	0.83	500	144	176	188	169
60	70	1600	100	0.89	500	156	168	184	169
					Average	149	161	180	163

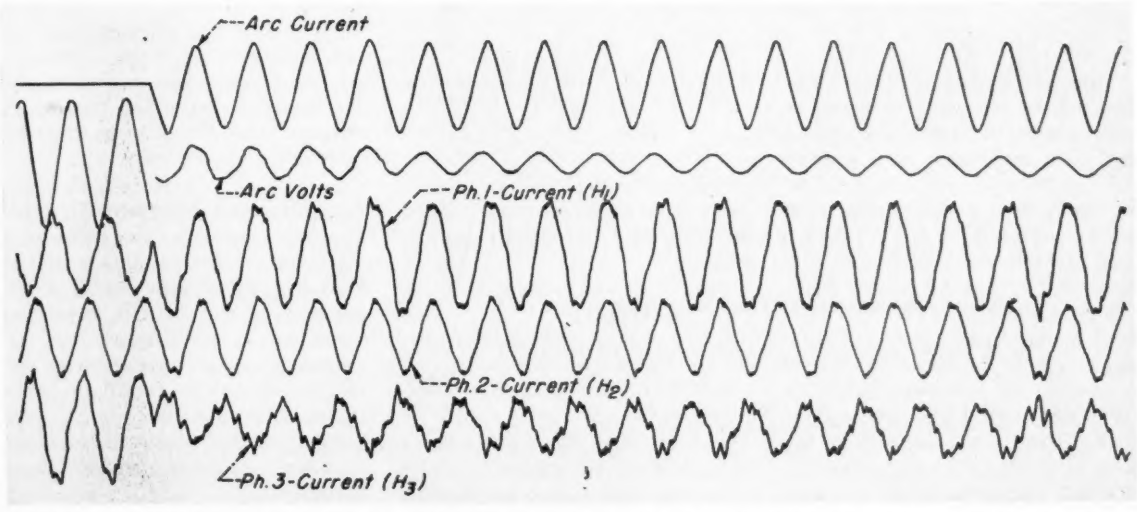
Table III—Evaluation of Secondary and Primary Current of Several Shots

Osc. No.	Arc Peak Amp	Pri. Peak Amp H1	H2	H3
M-53-1	3900	565	274	440
M-53-2	3936	402	240	307
M-53-3	2820	410	256	263
Ave. Peak Amp		459	257	337
Ave. RMS Amp (Form Factor = 0.65)		298	167	219

Comparison of Ave. RMS Amp with Table II Ave. Amp

	Surge	Steady Load	Ratio
H1	298	149	2.00
H2	167	161	1.04
H3	219	180	1.22

Note—Results are close to those predicted since transformer was set at 40% reactance.



CONNECTION DIAGRAM and meter locations used throughout one heat aid in the understanding of simultaneous readings in Table II

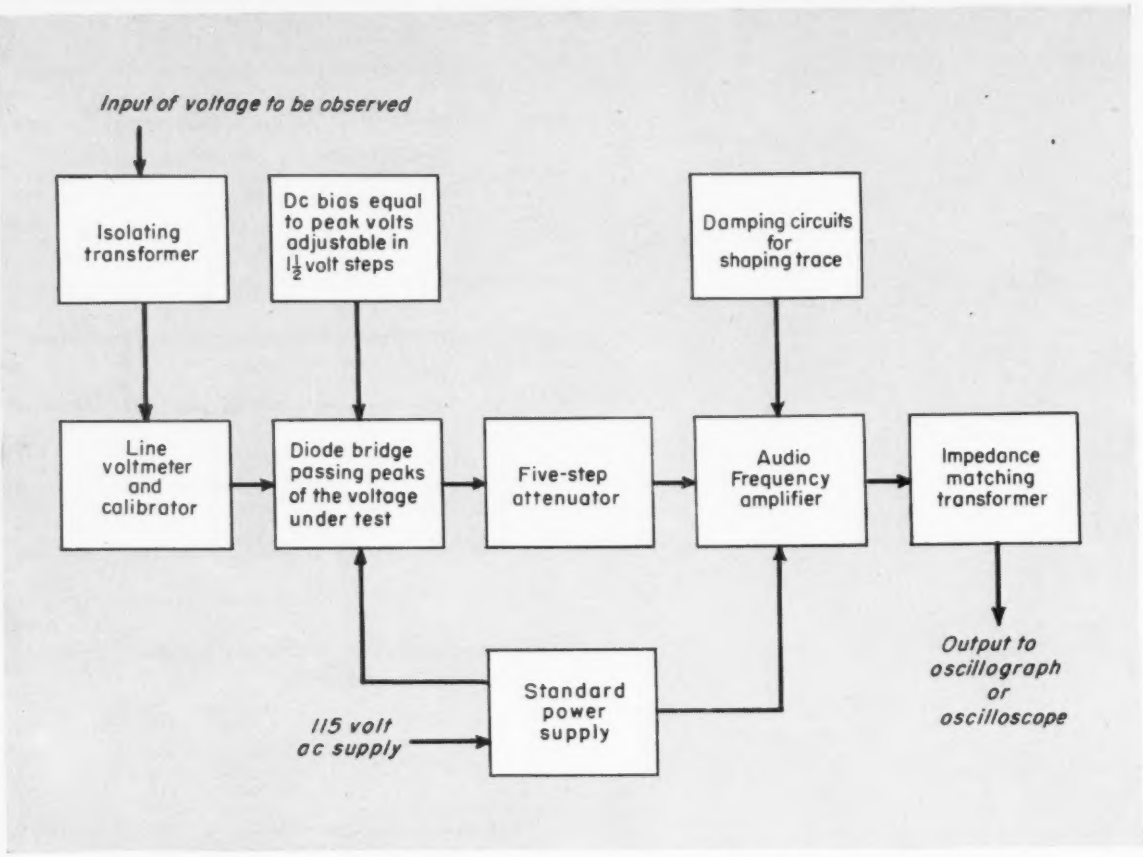

Input of voltage to be observed
Isolating transformer
Dc bias equal to peak volts adjustable in 1½ volt steps
Damping circuits for shaping trace
Line voltmeter and calibrator
Diode bridge passing peaks of the voltage under test
Five-step attenuator
Audio Frequency amplifier
Impedance matching transformer
Output to oscillograph or oscilloscope
Standard power supply
115 volt ac supply

FIG 1—CIRCUIT ARRANGEMENT of one phase of the 3-phase 120-v apparatus is shown above. Voltage variation of each half cycle above a set minimum voltage is fed into an oscilloscope or oscillograph. This makes possible detection of variations within the 0.2 to 1.5% range

Georgia Power Co develops device for . . .

Measuring Small Voltage Variations

R. W. BAKER, Chief Distribution Engineer, Georgia Power Co, Atlanta, Ga.

Instantaneous system voltage variations can be accurately measured by using relatively inexpensive electronic circuits in conjunction with a standard oscilloscope and oscillograph. The lamp flicker that results from serving large intermittent or variable loads can now be detected and controlled within desirable known limits.

Standard instruments now available for detecting the frequency and duration of voltage variations are subject to reading and measuring errors of 1% or greater. They therefore fall far short of the desired accuracy in the range of 0.2 to 1.5% which is needed to detect voltage variations resulting in noticeable flicker.

Studies of voltage variations and the resulting flicker have established that the following conditions can be tolerated:

- 1.9% voltage variation at 1 variation per minute.
- 0.8% voltage variation at 1 variation per second.
- 0.5% voltage variation at 5 variations per second.

Another need for more accurate measurement of voltage variation arises from the nature of standard clauses in customer contracts pertaining to permissible voltage fluctuations. The determination of and compliance with fluctuation limits are the responsibility of the electric utility.

How Measuring Equipment Operates . . . The measuring equipment compares the variable ac voltage with a fixed dc voltage in a bridge diode circuit, using a portable battery for a standard. This eliminates the need for a fixed ac voltage. It also allows the variation of each cycle of the ac voltage to be determined.

After several trials, the following operating characteristics were achieved:

1. Low drain on voltage source to

be measured (120-v winding of a potential transformer).

2. Simple calibration and adjustment,

3. Low drain on dc battery standard,

4. Effective operation with a standard sensitivity recording oscillograph in such a way that 3-v variation would give up to 60 mm change in deflection,

5. Substantially linear response in proportion to the voltage change.

Problems were encountered in selecting a diode and matching the impedance of the diode circuit to the 0.45-ohm element impedance of the standard oscillograph. Vacuum tube diodes proved to be substantially linear over the expected operating range. But the very low load impedance required one stage of amplification to produce the desired deflection sensitivity and impedance matches.

Such circuit refinements as a calibrating switch, line voltmeter, adjustable bias battery to set the operating point, and insulating input transformer helped the device perform to the required pattern.

The diagram (Fig 1) indicates the connection and operation of the equipment which accomplished the performance objective. The adjustable bias battery varies the operating range in steps of approximately 1 v ac (rms) and is set so that the lowest input voltage anticipated will just pass current through the bridge on each half cycle peak. Any voltage larger than this minimum sends a pulse of current through the bridge at each half cycle, the amplitude of which is proportional to the increase in voltage. The attenuator is set on the step that gives the desired width of oscillograph trace. The damping circuits reduce the tendency of the equipment to overshoot when the trace returns to zero.

Application and Use . . . This equipment may be used for measurements on any 120-v source—house outlet socket, secondary of potential transformer, etc, provided the potential-to-ground of the circuit does not exceed the insulation limits of the isolating transformer. The equipment is adjusted and calibrated for each installation to indicate on an oscilloscope or record on a recording oscillograph the voltage variation of each half cycle in a 6-v range above some predetermined minimum voltage.

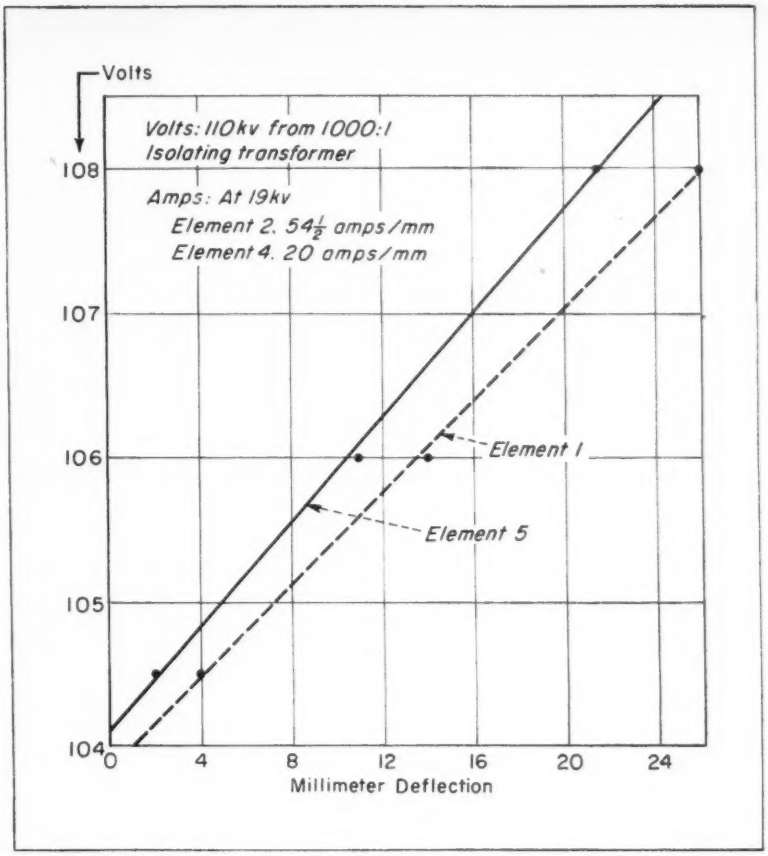


FIG 2—CALIBRATION CURVE for two phases of device working at 20% of maximum show deflection of 5.5 mm per v. Deflection up to 20 mm per v can be obtained by adjustment

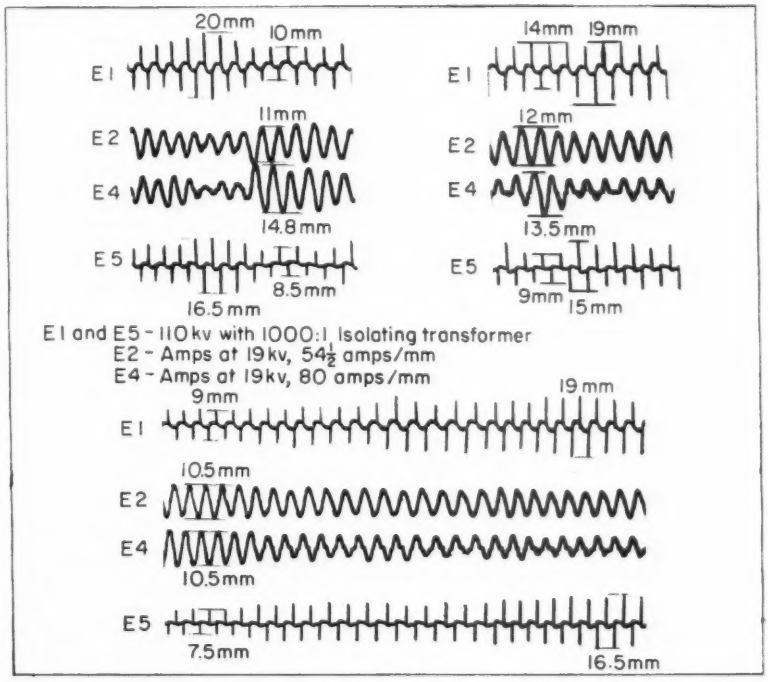


FIG 3—OSCILLOGRAPH traces show voltage of a delta to Y station, 110-19 kv phase to phase, serving a 15,000-kva arc furnace during a melt down period. Curves of Fig 2 apply

'Arkansas Plan' Publicized by Reader's Digest Story

The "Arkansas Plan" for self-development by communities and the plan's originator are getting some additional publicity. The December issue of Reader's Digest is carrying a five-page story, "Mistah Ham vs Uncle Sam."

Mistah Ham is Hamilton Moses, who as president of Arkansas Power & Light Co originated the plan to build his company by building the state. The story, written by Roving Editor William Hard, Sr, relates the success of the Arkansas company in stopping government attempts to get into the power business in the state.

Moses, who is now chairman of the board, has recently invaded Tennessee to appear on forums against public officials such as Senator Gore. In these appearances he has been advocating that the Tennessee Valley Authority pay federal, state, and local taxes at the same rate that privately owned utilities pay them. He also wants TVA to pay the full cost of the money it has borrowed from the federal government. As he says, "Treat all citizens alike."

PUAA Membership Reaches Record 400

Active membership of the Public Utilities Advertising Association has reached a record high of 400. This is an increase of 26 in the past six months. This announcement was made at the recent meeting of the officers and directors held at Minneapolis.

The program for the 1954 convention, May 13-14, at Boston was changed so that it will be a full-scale workshop featuring case problems and shirtsleeve sessions. The change was made because of the great success of this type of program at the various regional meetings.

How Cold Will It Be?

Fifteen clothes dryers, one each of 15 different makes, have been offered as prizes in a temperature guessing contest in Minneapolis. Sponsoring the Twin City Weather Prophet Contest is the Electric Appliance Dealers Association with headquarters in Minneapolis. Contestants must get an entry blank from a member dealer and guess the highest and lowest temperature on Thanksgiving.

Cleveland EI Invites Aluminum Rolling Mill

Cleveland Electric Illuminating Co believes that the best site for an aluminum rolling mill in the Great Lakes area is in its territory—"The best location in the nation." To prove this the company has recently released an elaborate study of the economic factors involved.

The study analyzes aluminum mill facilities in North America, economics of the aluminum market, transfer costs, economics of labor, relative electric power costs, aspects of financial investment, and future aspects of the aluminum industry.

Metermen Publicized

Adventures of the meter readers of Public Service Co of Colorado recently made a good feature for the Denver Post. The story dealt mainly with their encounters with animals, everything from a gila monster to a lion. The story ran on page 3, but a picture keyed to the story was given prominent play near the top of the first column on the front page.

Adds Area Department

Duquesne Light Co has formed an Area Development Department to promote and publicize Pittsburgh and the surrounding area. H. L. Donaldson, assistant to Philip A. A. Fleger, chairman of the board, has been appointed director of the department.

SCANNING THE ADS

Connecticut Light & Power Co—An advertisement headed, "Everything including the kitchen sink," was illustrated by a drawing of a family (parents and two children) standing among some 20 appliances found in the home. The kitchen sink angle was brought in by the garbage disposer. Theme of the ad was that with all the modern appliances people naturally use more electricity, and naturally their electric bills increase.

Consolidated Edison Co of New York—Sleep has been getting a lot of attention in recent ads of this utility. One ad played up the advantages of the electric blanket. Another in its series of "news picture" ads was a picture of a girl seated on a bed surrounded by a few of the 600 products sold in a "sleep shop" of a New York department store. Theme was that an electric blanket will keep you warm and prevent you from getting awake from cold once you have gone to sleep.

Georgia Power Co—"There's something friendly about a light switch." This headed an ad telling of how when a mother hears her baby crying at night, her hands go automatically to the light switch.

Northern States Power Co—Ad addressed "to every husband who's stuck for a gift idea" advised him to "Choose from these appliances every woman wants in her home." Appliances were listed in four divisions: Under $10, Under $20, Under $30, and Over $30. Copy was run at an angle against a dark screened background in 10 by 16-in. space.

Pennsylvania Power & Light Co—Superimposed upon a background made up of line after line of the words, "thank you", handwritten, was a drawing of a woman holding a roasted turkey. Copy read, "She'll never stop thanking you for her electric range."

"For a happy family give electric gifts" advised a 6 by 16-in. ad. Down the right side was a list of 58 electric appliances. Each was ruled off and followed by a small box to make checking easier. The left two thirds of the ad was devoted to the smiling faces of a father, mother, and their son and daughter.

Wisconsin Public Service Corp—Questions such as these: "Squinting at this paper?" "Shaving face instead of whiskers?" "Darning fingers more than socks?" were followed by "For goodness sake, light up. Good light is the cheapest of the good things in life." Illustrations were humorous.

WASHINGTON COMMENT

JESSE MOCK

Federal Power Rates Will Rise, But How Much?

Rates are going up on electric power produced at federal projects. Assistant Interior Secretary Fred G. Aandahl, who markets a major share of federally produced power, put the cards on the table in a speech in late September:

"It is time that we get away from the idea of giving power away at taxpayers' expense for the purpose of stimulating local public power."

He went on to indicate that past Democratic administrations had used cheap federal power coupled with the preference clause to encourage public bodies to get in the power business. Objective, he hinted, was eventually absorption of these local public systems into a vast federal monopoly of power.

Probably nothing would reverse this trend so quickly as raising federal power rates to provide an equitable return on the government's investment in power producing facilities.

The question is no longer whether the rates are going up. But still to be answered is when? and how much?

Rates Will not Rise Simultaneously . . . Interior Department, which markets power from the Army Corps of Engineers projects and those of the Bureau of Reclamation, has been working on various phases of the power rate problem for several months. No sudden and all-embracing federal rate hike is in the wind, but a gradual increase of all federal power rates over the next year or two is certain.

First to be affected will likely be the rates of Southwestern Power Administration which markets federal power in Texas, Oklahoma, Arkansas, and parts of Louisiana and Missouri. It is possible that substantial rate increases will be put into effect by SPA during the early part of next year (EW, Nov. 23, p 6).

The higher rate schedules will be apparent in the Southeast and Missouri River basin as contracts are negotiated next year. Federal hydro power in the Southeast will probably sell for upwards of 9 mills—making it economically feasible for peaking purposes only. In the Missouri basin, the rates will be considerably above the often quoted 5-mill rate but still should be economically useful in this high-cost fuel area.

Wholesale power rates of Bonneville Power Administration will hold at $17.50 per kilowatt-year until December of next year when rates come up for review. There has long been talk of raising them to $22.50 per kilowatt year, but the price adopted next year may be somewhat lower than that. Reason is that several of the high cost facilities which were to be on the line by that time have been delayed and are not being figured in the upcoming rate schedule.

Tennessee Valley Authority has gradually been raising rates on its industrial sales over the past year and one-half but is still sitting on its rate to preferred customers. It reasons that higher-cost steam-generating facilities are being installed primarily for industrial sales, and thus the only fair thing to do is to make those who benefit pay the bill.

Rates Will Rise for Two Reasons . . . There are two main reasons for the upcoming rate increases:

1. Projects built during the past few years are much more expensive than those built before World War II. This inflation must be reflected in rate schedules.

2. The Republicans are going about the job of tidying up the bookkeeping on hydroelectric projects. This requires raising the costs allocated to power—thus widening the rate base.

Effect of inflation on federal power rates is obvious. For the same reason, a number of electric companies have had to seek rate increases in recent years.

Effect of government bookkeeping on federal power rates is more complicated. It hinges largely on the controversial allocation of costs for multipurpose water projects. It was a frequent practice of past administrations to use one set of cost allocations in getting a project authorized and a much lower allocation in fixing power rates.

This practice has been roundly criticized by companies and by Congress. The Republican administration does not want to be a party to the ruse of keeping two sets of books. Thus you find Interior, the Corps of Engineers, and the Budget Bureau trying hard to coordinate and make some sense out of the bookkeeping methods of past administrations.

Backing up these agencies are the committees of Congress which will likely get down to the job of writing some ground rules for cost allocations during the next session of Congress.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Flat time-current characteristic of the inverse relay permits the relay to give reasonably fast operation over a wide range of fault current. It fits the situation where changes in the number of generators in use results in variation in fault current magnitude.

Operating dollars are wasted if operators are unable to adjust the control mechanisms for maximum effectiveness.

Nitrogen atmosphere over the oil in a power transformer is not wholly effective in prolonging the service life of the oil if air has not been removed from the oil.

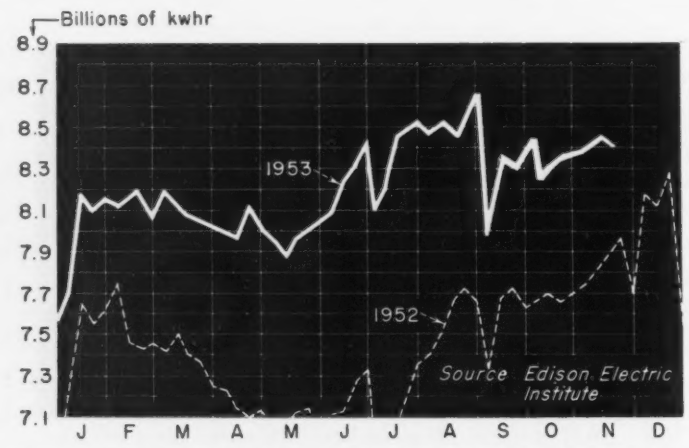
Migration of soil moisture away from a buried energized power cable can be traced with a Geiger counter if a trace of radioactive Cobalt 60 is dissolved uniformly in the moisture.

Rare earths, some vital to health, can now be separated from such vehicles as flyash by a new selective solvent technique.

Hard hats to be as effective electrically as they are mechanically should not have any metal rivets or inserts.

Remaining service life of generator insulation is something for which a reliable test is urgently desired because it would set the duty for the generator.

STATISTICS



Output Week Ended Nov. 21—8,416,116,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Nov. 21	+5.6	+1.6	+0.8	−1.7	+4.0	+17.4	+2.7	+8.5	+24.2	+5.4
Nov. 14	+7.3	+3.0	+3.4	+1.7	+5.7	+19.3	+2.3	+6.6	+21.9	+4.5
Nov. 7	+7.6	+5.4	+3.0	+1.9	+5.5	+18.8	+3.0	+6.9	+23.1	+6.5

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load (Million Kw)	Sept.	77.2	77.1	69.6
Capacity (Million Kw)	Sept.	87.59	86.63	78.76
Production (Billion Kwhr)	Sept.	37.04	38.50	33.38
Hydro	Sept.	7.59	8.45	7.36
Fuel	Sept.	29.45	30.04	26.02
Fuel Consumption				
Coal (Million Tons)	Sept.	9.70	9.70	8.84
Oil (Million Barrels)	Sept.	6.16	6.55	6.05
Gas (Billion Cu Ft)	Sept.	105.30	112.88	96.38
Sales (Billion Kwhr)	Sept.	32.64	32.82	30.11
Residential	Sept.	8.55	8.48	7.66
Commercial	Sept.	5.90	5.98	5.37
Industrial	Sept.	15.67	15.83	14.75
Other	Sept.	2.51	2.52	2.33
Net Income Class A & B Companies ($ Million)	Sept.	81.20*	77.43	74.14
Estimated Dec. '53 Peak (Million Kw)	Aug.	86.2	86.2	88.4
Kwhr per Residential Customer (12 Month Average)	Aug.	2,289	2,273	2,119
Revenue per Kwhr Residential Service (12 Month Average)	Aug.	2.76¢	2.76¢	2.77¢
Canadian Production (Billion Kwhr)	Aug.	5.09	5.18	4.97

Business Statistics

FRB Industrial Production Index†††	Sept.	236*	238	232
Gross National Product Annual Rate ($ Billion)	2ndQtr.	372.4	362.0	345.1
EW 5 Industry Production Index	Sept.	128.9	129.2	125.8
ENR Construction Cost Index††	Nov.	128.1	128.0	123.4
BLS Consumer's Price Index	Sept.	115.2	115.0	114.1
NEMA Insulation Materials Sales Index†	Sept.	153	153	142
NEMA Electric Appliance Sales Index†	Sept.	101	90	105
NEMA Household Refrig. Sales Index†	Sept.	62	63	69
Metal Prices (Nov. 24)				
Copper, Conn. V., lb		$.29-.30	.29-.30	.24¼
Lead, N. Y. lb		.13½	.13½	.14
Zinc, prime Western E. St. Louis, lb		.10	.10	.12½
Tin, Straits, qual. N. Y., lb		.85¼	.80	1.21½
Aluminum, ingot, base price		.21½	.21½	.20
Nickel, base price		.60	.60	.56½
Steel, billets, Pitts., ton		62.00	62.00	59.00
Steel, scrap, No. 1 heavy, Pitts., ton		36.00	36.00	46.00

*Preliminary **Revised †1947-49=100 ††1949=100 †††Unadjusted

Utility Investments Nearing 23 Billion

By the end of 1952, the amount of money invested in private electric utility plant was close to $23 billion dollars. About nine-tenths of this represents actual plant in service, in dollar terms, around $21 billions. Construction still in progress at the end of the year added another 1.6 billion,

Plant in Service—1952

	Amount	% of Total
Intangible	$21,725,403	0.1
Production		
Steam	6,495,023,765	30.9
Hydraulic	1,800,250,047	8.6
Internal combustion engine	95,503,491	.5
Total production	8,390,777,303	40.0
Transmission	3,213,028,411	15.3
Distribution	8,647,985,001	41.2
General	722,787,010	3.4
Total	**$20,996,303,128**	**100.0**

or about 7% of the total investment. The remaining 3% breaks down into three categories, the first representing $240 million dollars in adjustments in plant acquisitions of the excess of purchase price of utility property over its original cost, and the other two representing electric utility plant leased to others and plant held for future use, the two together amounting to about $85 million dollars.

A closer examination of the figures shows distribution plant to be the largest area of investment, with 8.6

Total Electric Utility Plant—1952

	Amount	% of Total
Electric plant in service	$20,996,303,128	91.4
Electric plant leased to others	62,006,442	.3
Construction work in progress	1,645,847,936	7.2
Electric plant held for future use	22,882,866	.1
Electric plant acquisition adjustments	239,909,782	1.0
Total	**$22,966,950,154**	**100.0**

Federal Power Commission—A&B Company Annual Report

billions being devoted to that phase of operations, or 41.2% of plant in service. Production investment including steam, hydraulic, and internal combustion engine plants follows closely with 40% of the total while transmission facilities accounted for another 15%. General plant investment (cost of office and general service buildings, etc) and intangible plant (mostly cost of organization and franchises) amounted to only 3½% of the total plant-in-service figure.

Financing May Set a Record in 1953

Electric companies sold $1.34 billion as "new money" for the nine months ended Sept. 30

All signs point to another record year in electric utility financing. Total securities sold to the public during the third quarter of this year amounted to $322 million, nearly $100 million more than the same quarter last year.

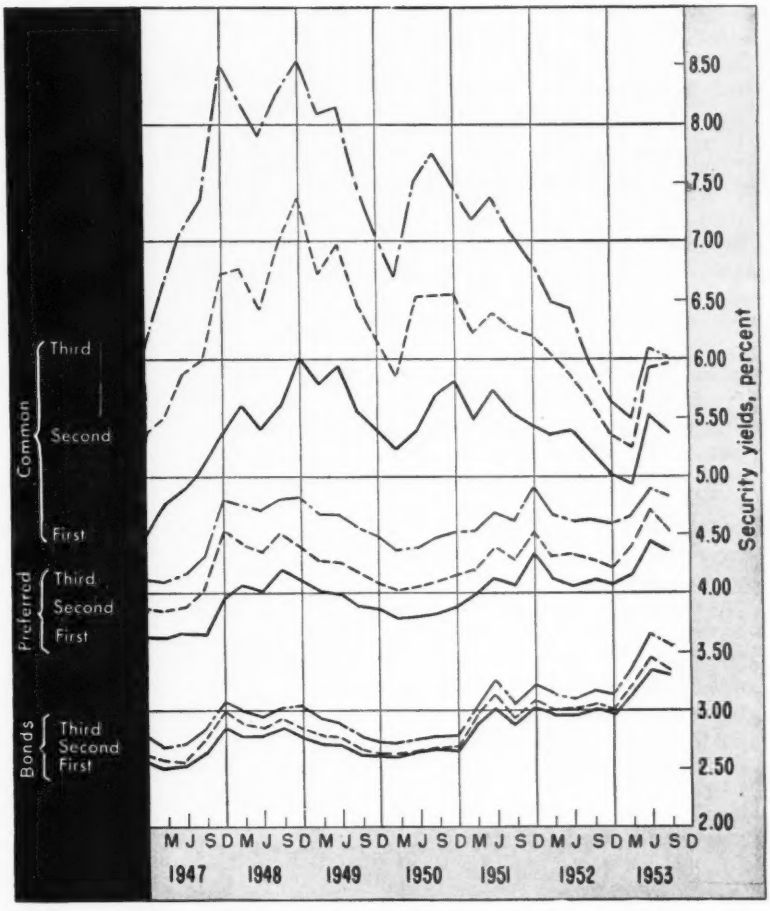
Nine months' public offerings added up to a total of $1,345,486,000 compared with approximately $1,305,457,000 sold during the same period in 1952. In the first nine months of this year direct sales to insurance companies, banks, pension funds and similar buyers, aggregating some $200 million, has been close to the volume of private sales during all of 1952. In addition, nearly a half billion dollars of bonds and notes were sold by Ohio Valley Electric Corp and Electric Energy, Inc.

Bond Market in Limelight . . . Investors' attention focused on the bond market which absorbed some $205 million electric company debt issues during the third quarter through public offerings.

During the first two weeks of June the bond market was at its lowest level in several years. Money was extremely tight as evidenced by the interest cost on 91-day bills the Treasury sells competitively each week. This cost climbed to 2.42%, the highest rate paid on a comparable issue since the bank holiday in March 1933. The "bill rate" is the most sensitive barometer of conditions in the short term money market.

During the summer months confidence was slowly restored and bond prices rose hesitatingly until the middle of September. At that time debt prices took a sudden and unexpected turn upward although the volume of new municipal and corporate offerings in September was at a near-record high for that month.

The chief explanation for the recovery in bond values can be traced to actions taken by the Federal Reserve Board in abandoning its laissez-faire policy of over two years standing.



SECURITY YIELDS went down on all qualities of bonds, preferred, and common stocks in the quarter with the exception of second quality common stocks which rose from 5.93% to 5.97%

Tight money conditions last spring raised interest costs to all new borrowers, and fears were expressed that this would cause a slowing down of business and lead to a recession. The Federal Reserve began to supply the

Public Offering—Electric Utility Securities

(Thousands of Dollars)

	Nine Months of 1953			Nine Months of 1952		
	New Money	Other	Total	New Money	Other	Total
Bonds, Notes, and Debentures	748,700	2,000	750,700	771,559	.....	771,559
Preferred Stock	143,992	6,642	150,634	154,048	.....	154,048
Common Stocks (a)	443,253	899	444,152	374,249	5,601	379,850
Total	**1,335,945**	**9,541**	**1,345,486**	**1,299,856**	**5,601**	**1,305,457**
	Third Quarter of 1953			**Third Quarter of 1952**		
Bonds, Notes, and Debentures	205,500	.....	205,500	134,000	.....	134,000
Preferred Stock	2,000	.....	2,000	46,180	.....	46,180
Common Stocks (a)	114,217	899	115,116	44,663	.....	44,663
Total	**321,717**	**899**	**322,616**	**224,843**	.....	**224,843**

Source: Reis & Chandler, Inc.
Notes—Bonds are taken at principal amount and stocks at the price to the public. (a) Offerings to stockholders under subscription rights are included in same quarter as the date of stock record.

market with funds through the purchase of government securities. These purchases were concentrated in the months of June and September. It also lowered reserve requirements of member banks in July thus permitting an expansion of loans.

Credit Eased . . . Another factor easing credit was that the normal seasonal rise in business loans failed to materialize, a fact not anticipated even in mid-August. Note should also be taken of the fact that the seasonal pattern may be modified since corporations pay most of their income taxes by June 15, and during the second half of the year cash accumulates in the form of tax reserve accruals. Interest cost on the weekly bill offerings offered evidence of the rising supply of money over demand. During the first half of September the Treasury's interest cost on these bills remained just under 2%, but in the final week of the month the cost was 1.58%.

The prices of government securities are quick to respond to any change in the money market. Banks are the principal purchasers and place in these highest quality issues funds they are not loaning out. The level of municipal and corporate bond prices is determined to a considerable extent by the price of government bonds. During the period of credit stringency in June, the Treasury's 3¼% 30-year bonds, issued May 1 at par, could be purchased at a price to yield 3.32%. By mid-September the yield was 3.22%, but at the close of the month it had dropped to 3.12%.

Interesting Problem, Interest . . . Electric companies, together with other borrowers, have little control over their interest costs. Compare, for instance, the market reception accorded four electric companies' 30-year mortgage issues, all carrying Moody's Aaa rating during the June-September period. In each case, the interest cost to the company was between .06-.07% higher than the percent return to the investor based on offering prices.

The investment return on each was as follows: 3.75% on a $25 million, 3⅞% issue of Consolidated Gas, Electric Light & Power Co of Baltimore offered in early June; 3.625% on a $40 million, 3⅝ 1% issue of Commonwealth Edison Co sold in

(*Continued on page* 171)

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1953									
Nov. 19	**3.10**	**3.14**	**3.36**	**4.18**	**4.38**	**4.64**	**5.22**	**5.64**	**5.77**
Nov. 12	3.07	3.13	3.31	4.16	4.35	4.61	5.20	5.65	5.75
END OF QTR.									
3rd 1953	3.30	3.33	3.54	4.35	4.52	4.83	5.36	5.97	6.01
2nd 1953	3.34	3.46	3.64	4.47	4.70	4.88	5.52	5.93	6.10
1st 1953	3.15	3.23	3.39	4.16	4.41	4.66	4.95	5.24	5.50
4th 1952	2.99	3.03	3.15	4.06	4.22	4.59	4.98	5.33	5.62

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months Ended		Net Income 1953	Net Income 1952	Earnings Per Common Share 1953	Earnings Per Common Share 1952
Carolina Power & Light	12	Oct.	$7,259,414	$7,000,937	$....	$....
Cincinnati Gas & Electric	12	Sept.	10,979,484	10,073,573	1.52(a)	1.40(a)
Cleveland Electric Illuminating	12	Sept.	14,698,809	12,332,852	4.05(b)	4.01(b)
Commonwealth Edison, consolidated	12	Sept.	36,359,273	33,066,249	2.34(c)	2.27(c)
Idaho Power	12	Sept.	4,541,948	3,560,547	3.39(f)	3.17(f)
Minnesota Power & Light	12	Oct.	4,008,314	3,326,393	2.00	1.60
New York State Electric & Gas	12	Sept.	8,564,655	7,486,380	2.71	2.39
Northern Indiana Public Service	12	Sept.	8,961,840	8,384,587	2.39(g)	2.31(g)
Public Service of Indiana	12	Sept.	11,482,430	9,819,899	2.32(h)	2.42(h)

Notes—(a) Based on 6,505,000 shares in 1953 and 6,405,000 shares in 1952; (b) Based on 3,342,308 shares in 1953 and 2,789,476 shares in 1952; (c) Based on 14,345,683 shares in 1953 and 13,732,000 shares in 1952; (f) Based on 1,125,000 shares in 1953 and 900,000 shares in 1952; (g) Based on 3,134,478 shares in 1953 and 3,084,190 shares in 1952; and (h) Based on 4,253,069 shares in 1953 and 3,712,835 shares in 1952.

FINANCING

Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
WEEK OF NOVEMBER 19-25			
Bonds			
Gulf States Utilities—1st mtg 3⅜% due 1983	$10,000	101.804%	3.28%
Illinois Power—1st mtg 3½% due 1983	20,000	102.25	3.38%
Preferred Stock			
Iowa Power & Light—50,000 sh 4.35% $100 par cum.	$5,000	100.00%	4.35%
Common Stock			
Maine Public Service—35,000 sh (being offered commonholders on a 1-for-6 basis, record Nov. 24 to expire Dec. 8 with an oversubscription privilege)	$709	$20.25	6.91%
Central Illinois Electric & Gas—70,400 sh (being offered commonholders on a 1-for-10 basis, record Nov. 19 to expire Dec. 8)	1,725	24.50	6.53
Arizona Public Service—240,000 sh	4,080	17.00	5.29
Delaware Power & Light—232,520 sh (being offered commonholders on a 1-for-7 basis, record Nov. 25 to expire Dec. 16; employees to be given right to subscribe up to 150 shares)	5,580	24.00	5.83
SCHEDULE FOR DECEMBER—JANUARY			**Bid Date**
Bonds			
Monongahela Power—1st mtg due 1983	$10,000	.....	Dec. 1
Columbus & Southern Ohio Electric—1st mtg due 1983	10,000	.....	Dec. 1
Iowa Power & Light—1st mtg due 1983	8,500	.....	Dec. 2
Florida Power Corp—1st mtg due 1983	10,000	.....	Dec. 2
Philadelphia Electric—1st mtg.	20,000	.....	Dec. 9
Appalachian Electric Power—1st mtg due 1984	20,000	.....	Jan. 11
Public Service Co of Indiana—1st mtg due 1984	25,000	.....	Jan. 12
Consolidated Edison Co of New York—1st mtg.	35,000	.....	Jan. 12
Ohio Edison—1st mtg due 1984	30,000	.....	Jan. 19
Savannah Electric & Power—1st mtg.	3,000	.....	.....
Central Illinois Electric & Gas—1st mtg.	4,000	.....	.....
Philadelphia Electric—1st mtg due 1983	20,000	.....	.....
Debentures			
Quebec Hydro-Electric Commission due 1978(a)	$50,000	.....	Dec. 2
Preferred Stock			
Duquesne Light—100,000 sh $50 par	5,000	.....	.....
Savannah Electric & Power—7,000 sh $100 par 5.36%	700	.....	.....
Central Illinois Electric & Gas—15,000 sh $100 par	1,500	.....	.....
Narragansett Electric—150,000 sh $50 par	7,500	.....	Dec. 16
Iowa-Illinois Gas & Electric—40,000 sh	.....	.....	.....
Common Stock			
Virginia Electric & Power—558,946 sh	$.....	.....	Dec. 1
Consumers Powers—679,436 sh (to be offered commonholders on a 1-for-10 basis, record Jan. 7 to expire Jan. 22; employees will be given right to subscribe)	.....	.....	.....
Ohio Edison—527,830 sh (to be offered commonholders on 1-for-10 basis, record Jan. 14 with an oversubscription privilege)	.....	.....	.....

Notes—(a) First Boston Corp-A.E. Ames & Co group, underwriters.

Fault Locator Finds One Breakdown, Pays for Itself

W. H. FISHER, Electrical Engineer, California Oregon Power Co, Medford, Ore.

Location of one fault on transmission lines in mountainous country with a transmission line fault locator pays for the equipment by saving time and cost of patrolling and sectionalizing. This belief is held by California Oregon Power Co which has eight portable fault locators covering its most important switching centers.

Based on three years of experience with the devices, here are the company's procedures covering calibration, connecting equipment to faulted lines, interpretation of results, and maintenance. Operation of fault finder is simple. It sends an electrical pulse along a transmission line that is reflected back to source by any abrupt impedance change, such as an open, grounded, or cross-phased condition. Points of generation and reflection of pulse are viewed on a cathode ray oscilloscope calibrated to show intervening distance to fault.

Equipment Needed . . . Locators consist of a pulse generator; oscilloscope; coupling equipment, which includes a center-tapped drain coil, two 10-kv, 0.5-amp fuses, and two 20-kv coupling capacitors; and a voltage regulator. A section of twisted pair cable 100 ft long with hook sticks is used to connect locator to overhead line.

Generator and oscilloscope are packed separately in foam-rubber-lined boxes to protect them during transit. Coupling equipment is connected as a unit in another box.

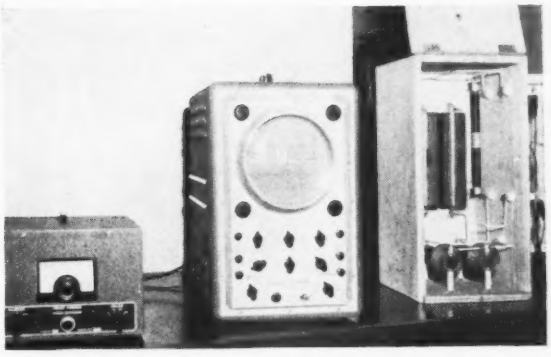
Calibration of each locator is set by manufacturer from characteristics of the line on which unit is expected to be used. Distance to fault is determined by reading the range dial and using a calibration curve to get distance. When unit is first obtained, lines on which it will be used are taken out of service; and calibration is checked on each line. Readings are taken to known line discontinuities and to open disconnect switches.

Sometimes slight adjustments are sufficient to make unit read accurately on all lines of similar construction. For lines having different characteristics, it may be necessary to determine a multiplier for use with the calibration curve.

Photographs of the trace on oscillograph representing lines under normal conditions also are taken. These are used by operators for comparison with a faulted line.

Locating Fault . . . Connecting locator to a faulted line first calls for standard line clearance procedure to be followed. The line grounding switch normally is kept closed while connections are being made with hook sticks. Switch is opened only when fault location tests are being made. Coupling unit is located as near as possible to the point of line connection. Mid-point of drain coil is well grounded.

In interpreting oscilloscope traces, operators are guided by the fact that reflected pulse will show positive (above base line) for open circuit or increase in line spacing. Pulse will show negative (below line) for partial or complete short circuits or decrease in line spacing. Magnitude of the pulse is a direct indication of fault resistance.



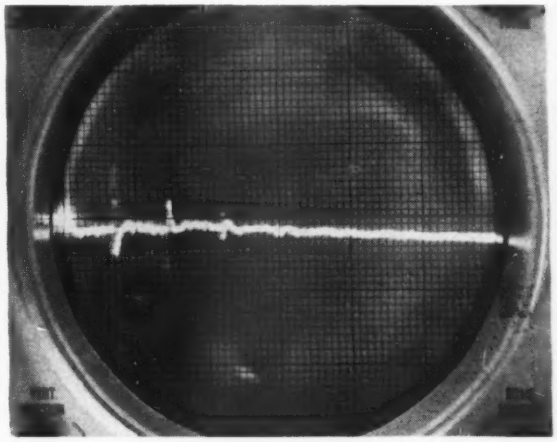
LINE FAULT LOCATOR consists of pulse generator (left); oscilloscope; and coupling equipment of fuses, capacitors, and center-tapped coil mounted as complete unit. Locator weighs about 66 lb

After operators have become familiar with the locator, they may be able to locate the fault within a span or two. Furthermore, by transferring leads from one set of phase conductors to another, it is possible to tell whether one or more conductors are faulted. This is quite useful information in that it tells how many men and what equipment need to be dispatched to the faulted line.

Arcing faults normally cannot be detected with the locator. However, in one case the operator happened to be watching the scope when a loose conductor swung into adjacent phase during a wind storm. From the trace he was able to determine the approximate location of the loose conductor.

Maintenance of eight locators has been no particular problem. In three years of operation, it has been neces-

(*Continued on page* 104)

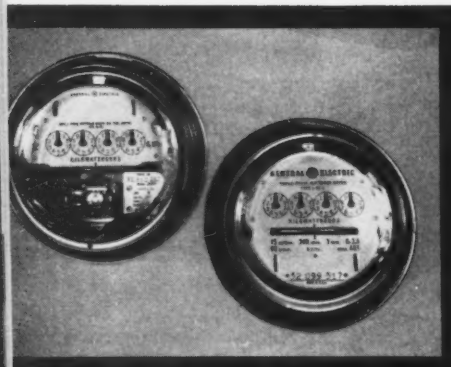


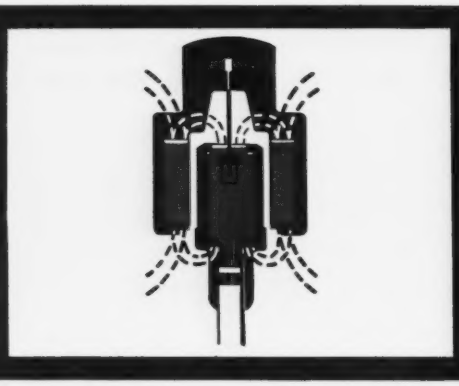
NATURE OF FAULT may be determined to large degree by trace on screen. Pulse above line generally means open circuit; below line, short circuit. Magnitude of pulse indicates fault resistance

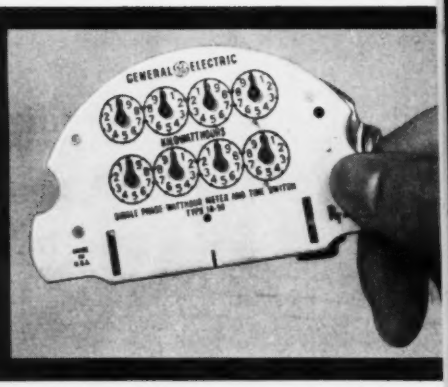
Another new member of the I-50 family

7 REASONS WHY THIS NEW G-E METER*

WILL LOWER YOUR METERING COSTS



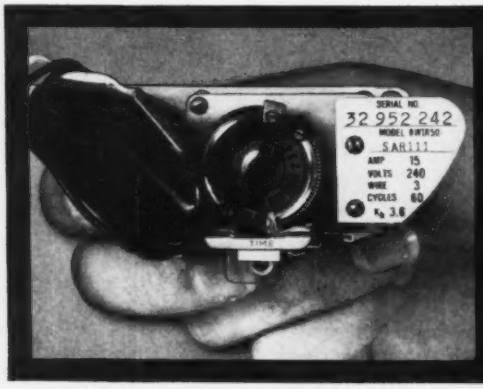


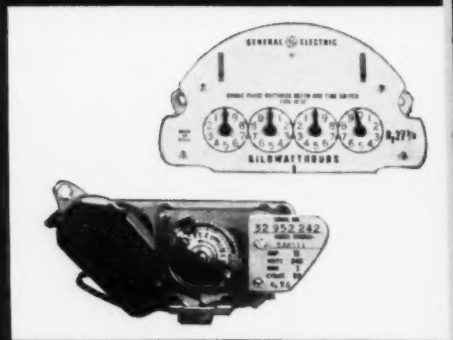


1 **NEW TYPE IR-50** for off-peak control incorporates the many features of the G-E I-50 meter to bring you greater dependability and accuracy.

2 **MAGNETIC SUSPENSION SYSTEM,** identical to the I-50 watthour meter's "floating disc," eliminates bearing wear and thus keeps maintenance costs to a minimum.

3 **NEWLY REDESIGNED REGISTER,** either single or double rate, has maximum legibility and accuracy. Resetting is simplified with individual plungers.





4 **IMPROVED TIME SWITCH** mechanism in new IR-50 incorporates 40-ampere silver contacts and Type SG-2 timing motor with the time-proven Telechron** rotor for longer life.

5 **TIME SWITCH AND WATTHOUR REGISTER** are separate assemblies and can be removed from meter independently, making maintenance easier.

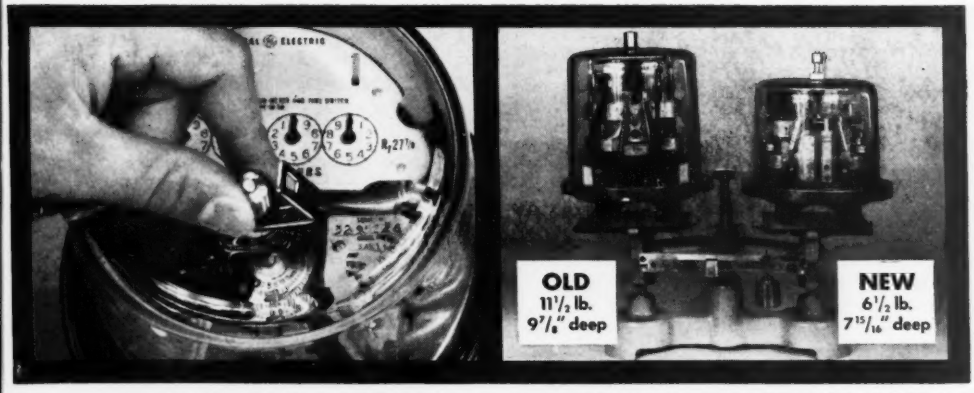
***THE GENERAL ELECTRIC IR-50 COMBINATION WATTHOUR METER AND TIME SWITCH** is the newest member of the I-50 family. For a sample demonstration, or for more information, contact your nearest G-E representative or write: Section 601-100, General Electric, Schenectady 5, N. Y.

**Reg. Trade-mark of General Electric Company.

NEW

General Electric Type IR-50 combination watthour meter and time switch

NEWEST MEMBER of the General Electric I-50 family, the IR-50 meter registers and controls off-peak water-heater loads. Proven I-50 meter features such as stability of calibration, inherent accuracy, co-ordinated insulation, surge protection mean lower operating costs.



6 **NO SCREWDRIVER IS NEEDED** for setting time dial on IR-50. External reset knob, which can be easily sealed or locked, facilitates setting.

7 **COMPLETELY NEW DESIGN** of the G-E IR-50 meter, ¼ smaller, and little more than half the weight of older types, means lower handling costs and faster, easier installation.

GENERAL ELECTRIC

Fault Locator

(*Continued from page* 101)

sary to change a tube only occasionally.

Some of the company's radio cars are equipped with 110-v ac generators which are used to operate fault locators in the field. In other cases a portable generator is used.

These fault locators have a maximum range of 150 miles. The company has never had occasion to operate over a distance greater than about 40 miles, although one section of line is 128 miles long.

LIGHT INTENSITY ranges from 1.36 to 2.65 ft-c (calculated) on the concrete roadway of the interchange and on sheet asphalt on Hilton St and Edmondson Ave, supplied by 20,000 lumen type EH-1 color-corrected mercury vapor lamps

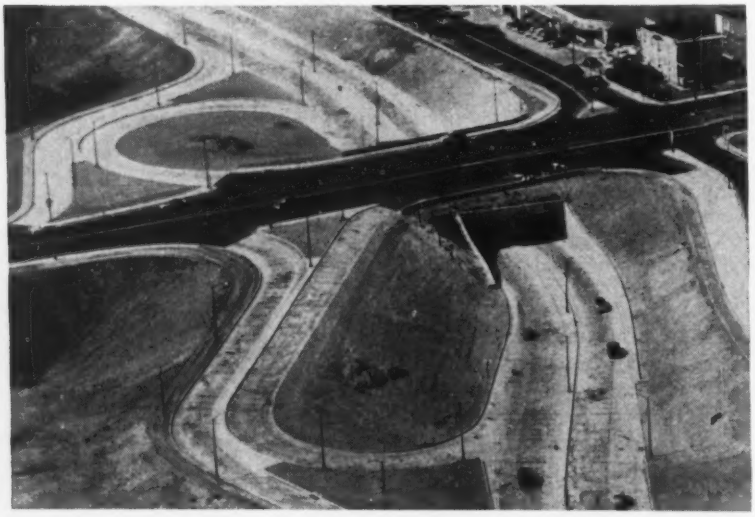
Baltimore Lights U.S. 1 and U.S. 40 Interchange

WALTER C. TOME, Supt. of Lighting

W. RAYNER STRAUS, Mechanical-Electrical Engineer, City of Baltimore, Md.

A mercury vapor street lighting installation in Baltimore aids in the expeditious traffic movement on the new interchange of two important north-south and east-west arterial highways—U.S. Route No. 1 and U.S. Route No. 40. This corresponds to Hilton St. and Edmondson Ave. in the west section of the city.

The installation consists of 175 type OV-20 luminaires with 20,000-lumen type EH-1 color-corrected lamps. They replace 41 600-cp, 19 400-cp, and 61 230-w incandescent lamps. Luminaires are mounted on steel poles with 6-ft mast arms, some with 8-ft and 10-ft mast arms, to give a 30-ft mounting height. Poles were made to specifications of Baltimore City's Bureau of Mechanical-Electrical Services.



LIGHTING INSTALLATION with eight multiple circuits facilitates traffic movement on this U.S. Route 1 and 40 interchange at Baltimore

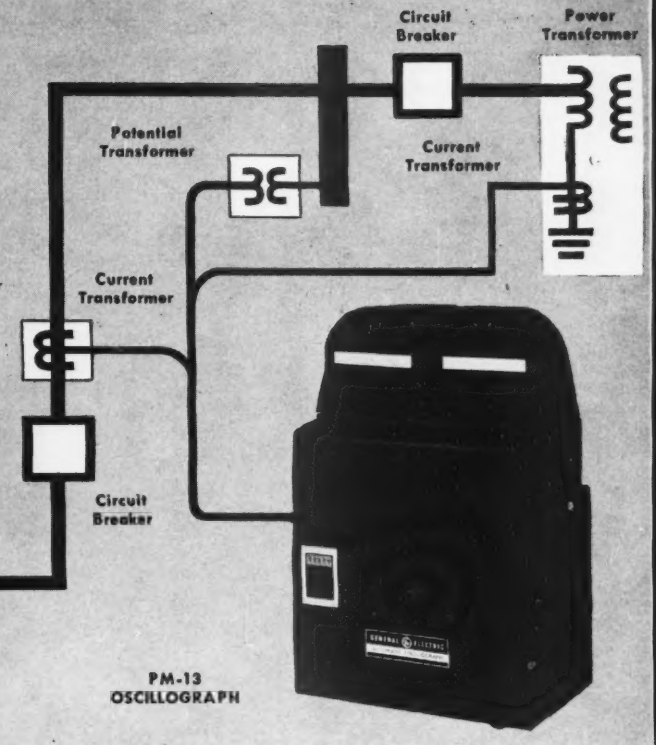
In the new interchange, consisting of approximately 1,800 ft of main roadway averaging 60 ft wide, 21 luminaires with type II and III distribution are installed, giving a light intensity of 1.5 ft-c on the concrete roadway. On 4,700 ft of ramps averaging 20 ft wide, 46 units with type II distribution are installed, giving a light intensity of 2.65 ft-c on the concrete roadway.

In each lane of the underpass, three luminaires are mounted on the center leg at approximately a 16-ft height. Light is directed in the direction of traffic movement thereby avoiding glare to the driver.

A section of Hilton Ave, about 1.1 miles south of the interchange, has 38 luminaires with type II distribution giving an average light intensity of 1.45 ft-c. Also a 0.9 mile section north of the interchange has 38 lighting units with type II distribution giving 1.36 ft-c. A section of Edmondson Ave, about 0.4 miles east of the interchange, has 26 lamps giving an average light intensity of 1.45 ft-c. Light intensities on both Hilton St and Edmondson Ave with sheet asphalt roadways are calculated values.

The 175 mercury vapor lamps are divided into eight multiple 240-v circuits, with a maximum of 34 and a minimum of 14 lamps to a circuit.

(*Continued on page* 108)



TRANSMISSION-LINE FAULT (ACTUAL PHOTO) CAUSED BY LIGHTNING IS AUTOMATICALLY RECORDED BY GENERAL ELECTRIC OSCILLOGRAPH.

NEW FEATURES INCLUDING 7-TRACE DESIGN HELP YOU TO . . .

Analyze System Faults Easier with a G-E Oscillograph

Designed to automatically record power system transient disturbances, General Electric's new PM-13 oscillograph now makes possible seven simultaneous traces. The oscillograph records quantities pre-selected by the system engineer such as ground current, line current, phase/ground potential, phase/phase potential, and Kw or Kva.

NEW LIGHT SOURCE

A flooding-type light source illuminates all seven of the new instrument's galvanometers. Because no lenses, prisms or apertures are used, no time-consuming optical adjustments are necessary when replacing lamps.

IMPROVED TIME RECORDER

The new PM-13 oscillograph is equipped with an automatic time recorder which photographically records the time and date of operation on the face of the oscillogram. For station or company identification, a plate may be added to the time mechanism.

UNIT CONSTRUCTION

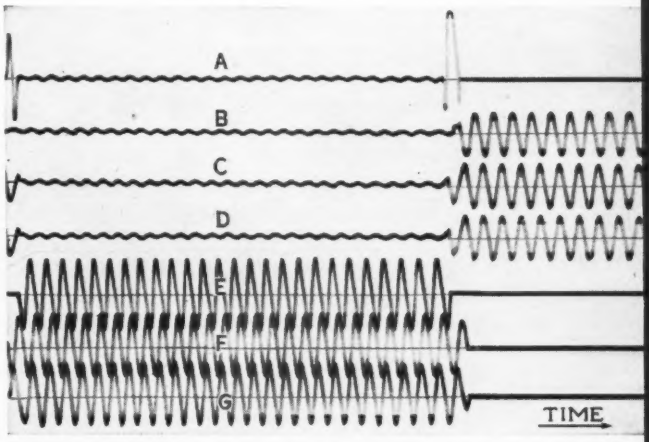
Constructed of simplified unit subassemblies, the front relay panel of the new G-E oscillograph is easier to inspect and maintain.

SIMPLIFIED PAPER HOLDERS

New, light-tight record paper holders mount easily on the top of the oscillograph. Holding up to 200 feet of record paper, the new holders make it possible to obtain as many as 100 oscillograms.

FURTHER INFORMATION

For further information, contact your local G-E Apparatus representative, or write for Bulletin GEC-396 to: Section 605–51, General Electric, Schenectady 5, N. Y.



OSCILLOGRAM SHOWS WAVE FORMS of ground current, line current, and phase/phase voltages resulting from lightning fault.

GENERAL ELECTRIC

GENERAL ELECTRIC
AMPERES
GENERAL ELECTRIC

COMPLETELY NEW—

G-E Hook-on Recorder

Here is a brand new solution to one of your old electrical-testing problems. General Electric's new CF-7 portable hook-on recorder (volt-ammeter) gives you the first convenient means of recording current without having to cut conductors or interrupt service.

By simply attaching leads, you can get voltage records over a wide range. The CF-7's butyl-molded transformer is insulated for 8700 volts.

FAST HOOK-ON INSTALLATION

You can install the CF-7 in little more time than it takes to use any hook-on instrument. Simply mount the recorder, select a range, attach leads, and hook on. Simplicity makes the CF-7 ideal for on-the-spot checking of loads on motors, circuits, and transformers.

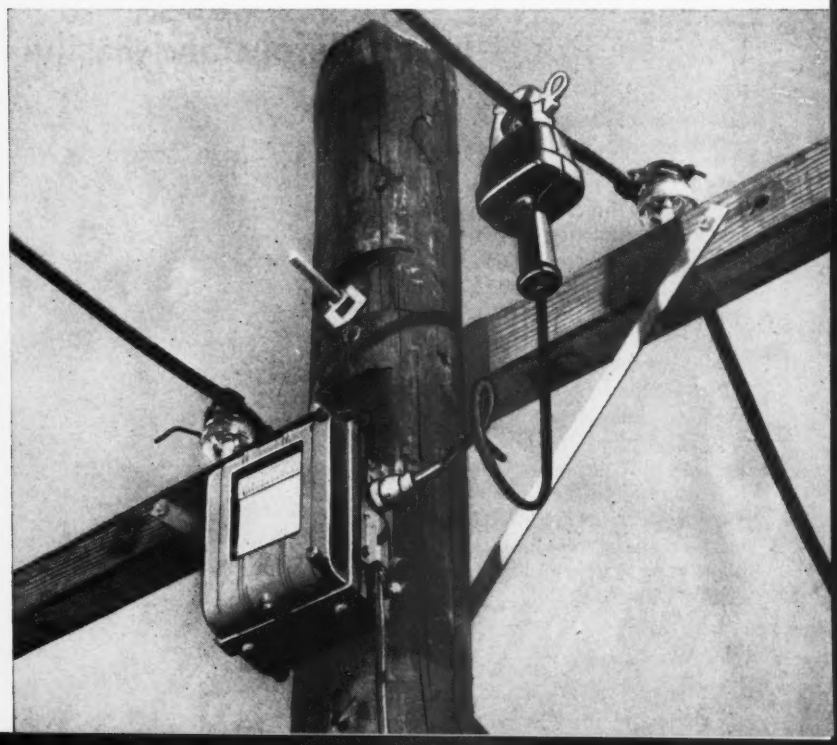
MINIMUM SERVICING

Consisting of a hook-on current transformer, connecting lead, and inkless recorder, this new instrument offers you:

- Inkless recording for minimum servicing, clean records;
- Weatherproof construction for outdoor and indoor use;
- Accuracy to 3% of full scale (4% above 625 amperes);
- Seven ranges—15/75/150/750 amperes, 150/300/750 volts.

See the CF-7 hook-on recorder at the Plant Maintenance and REA shows in January. For full details, contact your Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y. 602-267

SELF-SUSPENSION of the current transformer is made possible by a spring latch. Self-locking simplifies installation in such applications as checking of line loads.

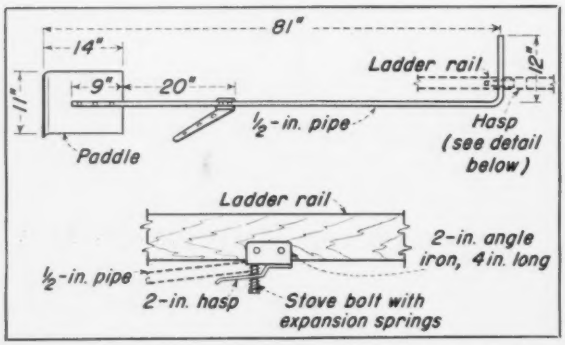


Interchange Lighting

(*Continued from page* 104)

Each circuit is controlled by a photoelectric relay operating a 2,400-v oil switch that energizes 2,400-240-v transformers. The new multiple mercury vapor lamp circuits utilize the old series circuit cable wherever possible.

The highway interchange lighting was designed by the Bureau of Mechanical-Electrical Services, Lighting Division, with the cooperation of the contractor, Consolidated Gas Electric Light & Power Co of Baltimore that supplies power for all street lighting in Baltimore.



MATERIAL ARRANGEMENT of safety paddle for ladder truck

Safety Flag Warns Truck Driver of Ladder Position

H. C. GANT, Atlantic City Electric Co, Bridgeton, N. J.

SAFETY FLAG obstructs driver's view when ladder is raised

A paddle-shaped "flag" which obstructs a service truck driver's view serves as a warning that the truck ladder has not been lowered to its horizontal position. It also aids in dispelling the uneasy feeling that the ladder is not secure. Thus, the paddle may prevent an accident in case the driver starts the truck before the ladder is lowered and fastened.

The paddle and its arm (see illustration) is fastened to one ladder side and is hinged to the ladder rack support over the cab. This safety device operates as follows: As ladder is raised from its horizontal position, the paddle lowers over the windshield to obstruct the driver's view. If this should happen while the truck is being driven, the driver knows immediately that the ladder is not secure in its horizontal position.

Materials required for the safety device can be obtained easily from scrap iron and are shown on the sketch. Atlantic City Electric installs flags on all ladder trucks.

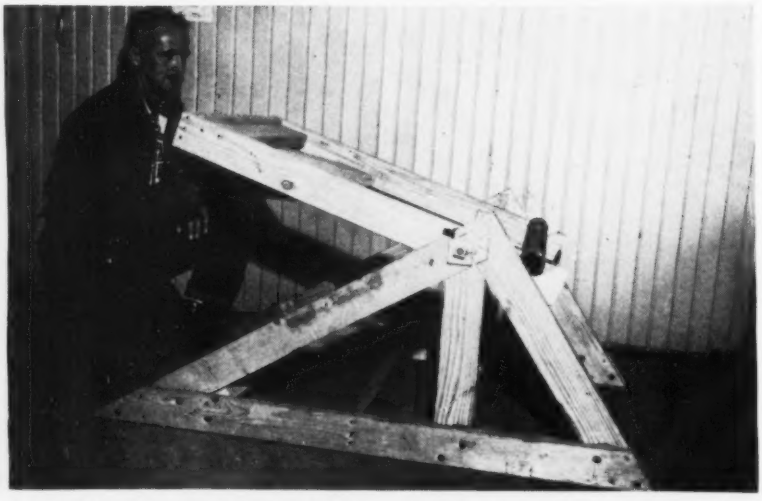
Loaded Reels Lifted Safely and Easily

WILLIAM NORRED, Electric Serviceman, Arizona Public Service Co, Phoenix, Ariz.

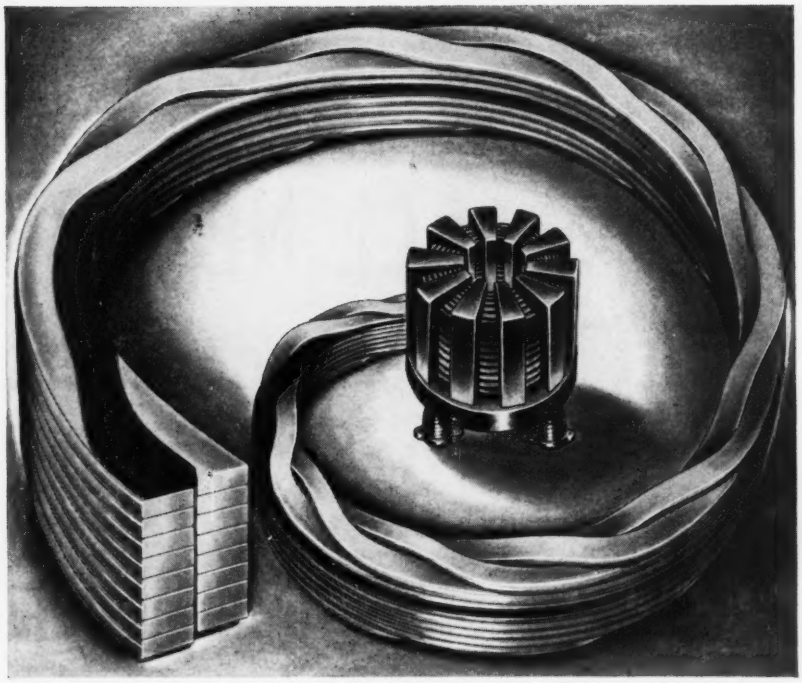
Wire may be removed from reels easily and safely through use of a wood reel lifter designed and built by Arizona Public Service Co. It will lift reels weighing up to 500 lb.

Lifter is made from sections of 2x4-in. lumber nailed and bolted together. Main feature is a lifting arm which multiplies applied force by five so that a push of only 100 lb is needed to lift the heaviest reel.

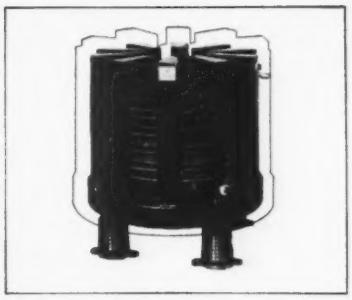
To raise reels, they are rolled into position and a bar is run through the reel hole and across the lifting arms. Then lifting arm is pushed down and secured with a bolt.



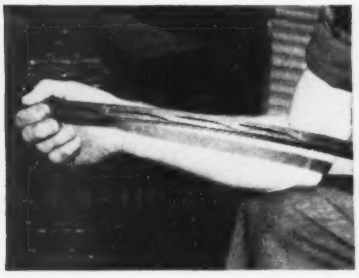
REEL LIFTER will raise loaded reels weighing up to 500 lb so that conductor may be withdrawn



CONTINUALLY TRANSPOSED RECTANGULAR CONDUCTORS—shown here schematically—are made possible by a specially designed machine. This exclusive G-E reactor feature results in more uniform current distribution and lower power losses.



COMPACTNESS Transposed conductors decrease volume up to 20%. You can fit G-E reactors in vaults too small for others.



ECONOMY By choosing G-E reactors with aluminum conductors you can save 10% on price without any sacrifice in reactor quality.

Compare . . . and you'll choose G-E Reactors

"Extra service" features of G-E cast-in-concrete reactors mean maximum protection and longer service life.

Industry's favorite for more than 35 years, G-E cast-in-concrete reactors offer you "extra service" features that make possible almost unlimited life with virtually no maintenance. For example:

Continually transposed conductor, an exclusive G-E feature, assures more uniform current distribution . . . lower losses . . . smaller dimensions.

Non-aging glass insulation gives greater short-circuit protection than any other wound insulation used in reactor manufacture . . . does not deteriorate even under high overloads . . . remains unaffected by moisture.

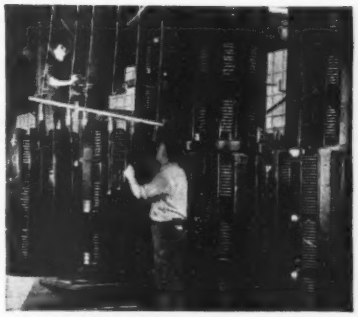
Wet steam curing of concrete assures full strength at shipment . . . eliminates potentially dangerous "in service" curing.

You also get such features as: good clearances; crossovers made within concrete; smooth, flameproof black phenolic varnish finish; and metal housings, complete with entrance and exit provisions, to minimize stray currents and protect reactors from damage.

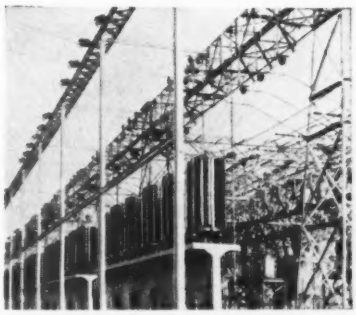
And you can have a 10% price reduction!

You can buy sturdy, dependable G-E cast-in-concrete reactors with either copper or aluminum conductors. By choosing aluminum conductors you can get the same long life, high short-circuit strength and low maintenance obtainable with copper conductors . . . at a 10% price reduction.

For full information contact your nearest G-E Apparatus Sales Office or write to General Electric Company, Section 422-8, Schenectady 5, New York.



AVAILABILITY You can get shorter shipments when you order RM reactors thanks to G.E.'s "repetitive manufacture" program.



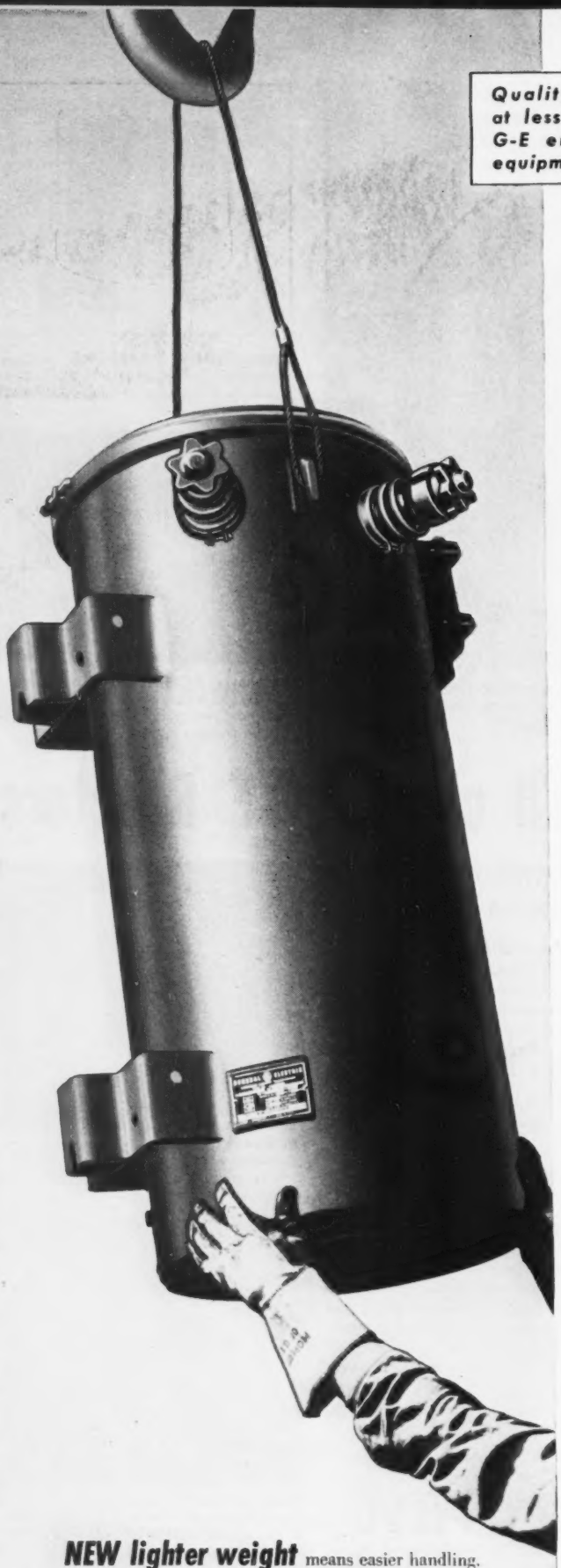
DURABILITY of G-E reactors is dramatized by this 30-year-old installation. It has given no trouble, needed little maintenance.

GENERAL ELECTRIC

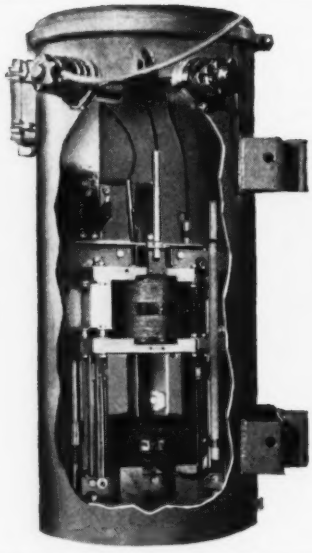
Quality lighting at less cost with G-E engineered equipment.

ALL NEW G-E Constant-current TRANSFORMER for Street-lighting Systems

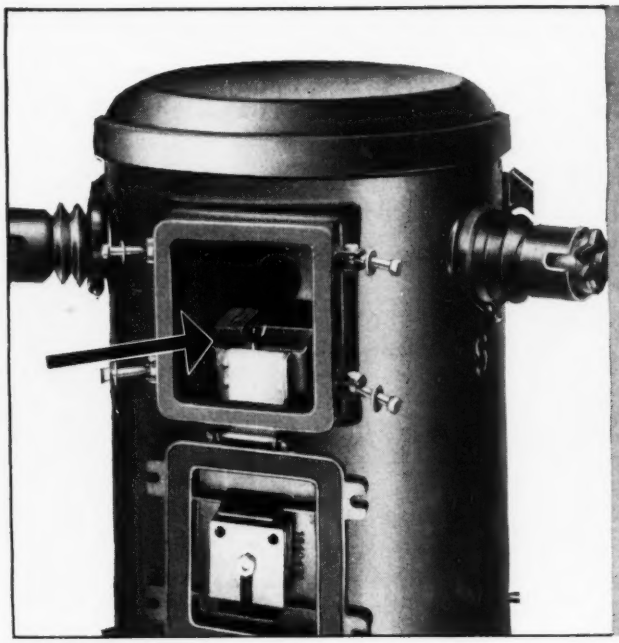
up to 33% lighter



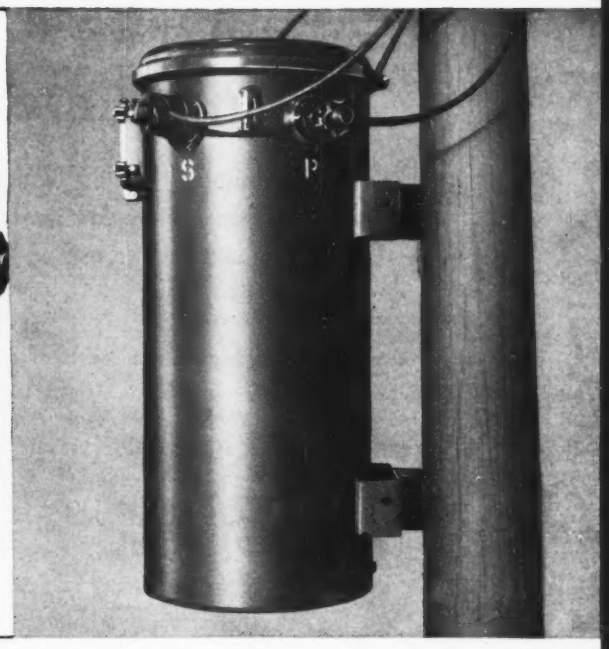
NEW lighter weight means easier handling. RO2 transformer, including oil, is 20% and 33% lighter in the 10-kw and 30-kw sizes respectively.



NEW faster response to load changes from radically new design which eliminates counter balance, introduces parallel straight-line motion, cuts down friction points.

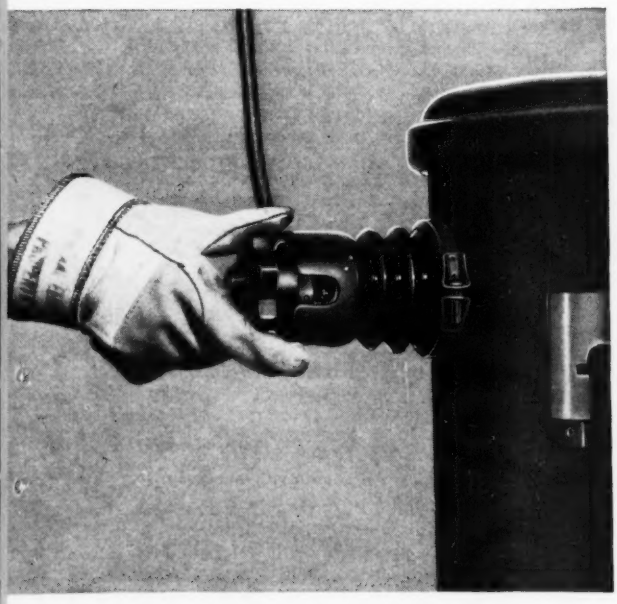


NEW easy adjustment is accomplished from the outside through convenient access door located above the oil level. Transformer cover need not be removed.



NEW easy mounting cuts installation time. Special slotted mounting bracket allows direct-pole mounting of models up to and including the 20-kw size.

. . and far easier to install and maintain



NEW simplified connections, quickly, without tools, by inserting the cable from either direction into the bushings and tightening the insulated handwheel.

G.E.'s new CC transformer for street lighting represents the most sweeping design advance in the industry in 50 years.

LESS FRICTION—It uses the magnetic suspension principle to completely support its moving coil. Thus, the only points of friction in the entire assembly are the two sleeve ball bearings which direct vertical movement of the moving coil.

LIGHTER WEIGHT—The new CC transformer is lighter and more compact, permitting pole mounting of larger ratings than was possible before. Grain oriented silicon strip steel in the core and aluminum wire in the moving coil conserve space and weight.

GREATER CONVENIENCE—Easy installation and servicing are assured by the simple mounting bracket, the cable bushings with their insulated handwheels. The access door on the side of the tank permits adjustments without removing the cover and reaching below the oil level.

VERSATILE—Designed to supply constant current for series street-lighting circuits, this new G-E CC transformer will operate efficiently with any type of lamp load.

MORE INFORMATION—Is available from your nearest G-E Apparatus Sales Office or authorized G-E street-lighting agent. Or write for Bulletin GEA-5975, Section 452-137, General Electric Company, Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

Conductor Tension and Guying

Accompanying tables facilitate guying calculations without use of formulas and graphs. They can be adapted to other conductor and guy wire sizes. Examples illustrate the use of the tables

Table 1—Conductor Breaking Strength and Tension

Conductor* Size—Strand	Breaking Strength, lb	Tension, lb 60% ult.	50% ult.
Copper, Hard Drawn			
4—3 str	1879	1125	940
2—7 str	3045	1825	1528
1/0—7 str	4750	2850	2375
2/0—7 str	5927	3555	2964
4/0—7 str	9154	5490	4577
ACSR			
4—6/1 str	1830	1100	915
2—6/1 str	2790	1675	1395
2/0—6/1 str	5345	3200	2673
4/0—6/1 str	8420	5050	4210

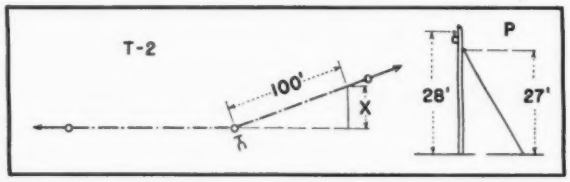
* Same sizes and kinds of conductors commonly used.

Table 2—Strain Factor (F) and Line Angles (X, ft)

X	5	10	15	20	25	30	35	40	45
F	0.05	0.10	0.15	0.20	0.25	0.30	0.36	0.41	0.46
X	50	55	60	65	70	75	80	85	—
F	0.52	0.57	0.63	0.69	0.76	0.82	0.89	0.97	1.00

Factor (F) from this table multiplied by allowable maximum conductor tension determines maximum horizontal pull. The pull bisects the angle made by conductors and must be counter-balanced by a guy. See Fig. T-2.

PROBLEM: Determine the horizontal pull by the conductors also on the guy for these conditions: Two No. 2-7 str HD copper conductors each stressed to 50% of its breaking strength. X measured in the field = 25 ft. Guy is attached as shown in Fig. P.



SOLUTION: Conductor tension (Table 1) = 1,528 lb. F (Table 2) = 0.25. Horizontal pull by the conductors = 1,528 × 0.25 × 2 conductors = 764 lb.

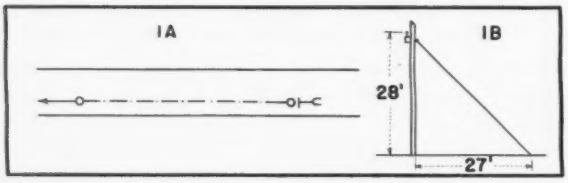
This horizontal pull will be exerted on a guy attached at the same height as the conductors. But this is usually not the case, so the horizontal pull must be modified by the ratio of the conductor height to guy attachment height. Ratio of conductor height to guy attachment height = 28/27 = 1.037.

Therefore, horizontal pull on the guy = 764 × 1.037 = 792 lb

Example 1

PROBLEM: Find the size of guy for dead-ending three No. 2-7 strand, hard drawn copper conductors. See Fig. 1A.

GIVEN: Maximum tension = 60% of breaking strength. Safety factor for guy = 1.5. Height of conductors = 28 ft. Length of guy lead = 27 ft.



SOLUTION: Refer to Table 1: 60% of breaking strength = 1,825 lb. Total pull for 3 conductors = 3 × 1,825 lb = 5,475 lb.

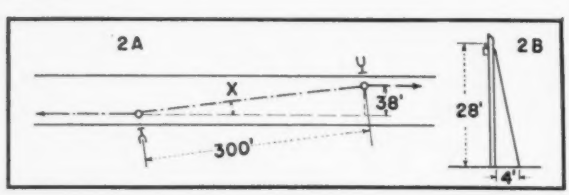
Guy height-to-lead ratio = H/L = 28/27 = 1.037 (use 1). See Fig. 1B.

Refer to Table 3: Use ratio 1 and read down in this column to rows containing safety factors of 1.5 until 5,475 lb is obtained.

Select a ½-in. Siemans-Martin guy which will stand 5,700 lb horizontal pull.

Example 2

PROBLEM: Find the size of guy for a line crossing the road. See Fig. 2A.



GIVEN: Conductors, two No. 4 ACSR. Maximum tension = 60% of breaking strength. Safety factor for guy = 1. Height of conductors = 28 ft. Length of guy lead = 4 ft.

SOLUTION: Refer to Table 1:60% of breaking strength of No. 4 ACSR = 1,100 lb. Total tension = 2 × 1,100 lb or 2,200 lb.

To obtain X where the road width and span length are known, use the law of similar triangles: 100/300 = X/38, then X = 12.7 ft. X may also be obtained by direct measurement in the field.

Refer to Table 2: In row X, the closest figure is 15 which has a pull factor (F) = 0.15. Then horizontal pull = 2,200 lb. × 0.15 = 330 lb.

Guy height-to-lead ratio = H/L = 28/4 = 7. See Fig. 2B. Referring to Table 3: Use ratio 7 and read down to the rows containing

Tables for Distribution Lines

HAROLD C. JOHANSEN, Pasadena, California, formerly Asst. Professor of Electrical Engineering, Purdue University

Table 3—Allowable Horizontal Pull for 3/8 in. and 1/2 in. dia Guy Cables

Guy Cables	H/L Ratio SF	10	8	7	6	5	4	3	2	1.5	1	0.8	0.5	0.2	0.1	0
3/8-in.....	1	688	860	978	1140	1320	1682	2200	3110	3780	4920	5430	6210	6820	6920	6950
Siemans.....	1.5	458	572	651	760	878	1120	1465	2070	2520	3280	3620	4140	4550	4610	4630
Martin.....	2	344	430	489	570	660	841	1100	1555	1890	2460	2715	3105	3410	3460	3475
1/2-in.....	1	1198	1500	1710	1980	2370	2930	3820	5400	6700	8550	9450	10820	11870	12040	12100
Siemans.....	1.5	796	1000	1140	1320	1580	1950	2542	3600	4460	5700	6300	7200	7900	8020	8050
Martin.....	2	599	750	855	990	1185	1465	1910	2700	3350	4275	4725	5410	5935	6020	6050
1/2-in.....	1	2475	3100	3525	4100	4900	6050	7900	11175	13650	17675	19525	22350	24525	24875	25000
Utilities.....	1.5	1650	2060	2350	2730	3260	4030	5270	7430	9100	11780	13020	14900	16350	16600	16650
Grade No. 4	2	1237	1550	1762	2050	2450	3025	3950	5587	6825	8837	9762	11175	12262	12437	12500

Note—This table shows the size needed for line and anchor guys.
H/L = Height-to-Lead SF = Safety Factor

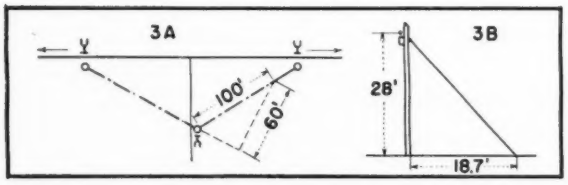
safety factor of 1 until 330 lb is obtained.

Select ⅜-in. Siemans-Martin guy that will stand a horizontal pull of 978 lb which is ample.

Example 3

PROBLEM: Determine how long a lead is necessary if a ⅜-in. Siemans-Martin guy is to be used at an angle (a flying corner) in the line. See Fig. 3A.

GIVEN: Conductors, two No. 2 ACSR. Maximum tension = 60% of breaking strength. Safety factor for guy = 1.5. Height of conductors = 28 ft. Height of guy attachment = 28 ft. X as measured in the field = 60 ft. X was determined by measuring 100 ft along the proposed span and then measuring perpendicular to a line extended from the adjacent span.



SOLUTION: Refer to Table 1; 60% of breaking strength of No. 2 ACSR = 1,675 lb. Total tension = 2 × 1,675 lb or 3,350 lb.

Refer to Table 2: In row X under 60, the pull factor (F) = 0.63. Then horizontal pull against the guy will be 3,350 lb × 0.63 = 2,110 lb.

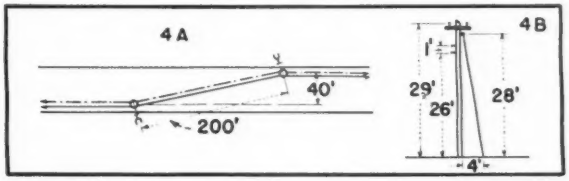
Refer to Table 3: In the row ⅜-in. Siemans-Martin guy with a safety factor of 1.5, read to the right to 2,520 (nearest to 2,110 lb pull) which corresponds to a guy height-to-lead ratio of 1.5. If H/L = 1.5, then L = H/1.5. But height of the guy attachment is 28 ft. See Fig. 3B.

The Lead therefore will be 28/1.5 = 18.7 ft.

Example 4

PROBLEM: Find the size of guy for an angle in a line having primary and secondary conductors. See Fig. 4A.

GIVEN: Conductors, No. 4-3 strand, hard drawn copper, two primary wires on a crossarm, two secondary wires on 1-ft vertical spacing. Height of primary conductors = 29 ft; guy attachment = 28 ft; upper and lower secondaries = 27 and 26 ft resp. Safety factor for guy = 2 (use only one guy). For construction see Fig. 4B.



SOLUTION: Refer to Table 1: Use 50% as breaking strength of No. 4 copper conductor, which = 940 lb. Total tension on the primary = 2 × 940 lb = 1,880 lb. Tension on each secondary conductor = 940 lb.

Determine X by similar triangles: 100/200 = X/40 then X = 20. Refer to Table 2: Pull factor (F) = 0.20. Horizontal pull due to the primary conductors = 1,880 lb × 0.2 = 376 lb. Horizontal pull due to each secondary conductor = 940 lb × 0.2 = 188 lb.

Determine the modified horizontal pull on the guy, as follows: Primary; 376 × 29/28 = 389 lb. Top secondary; 188 × 27/28 = 181 lb. Bottom secondary; 188 × 26/28 = 175 lb. Total modified horizontal pull on the guy is: 389 lb + 181 lb + 175 lb = 745 lb.

Guy height-to-lead ratio = H/L = 28/4 = 7. *Refer to Table 3:* Allowable horizontal pulls for guys with a H/L = 7 and a safety factor of 2 are: ⅜-in. Siemans-Martin = 489 lb, and ½-in. Siemans-Martin = 855 lb.

Select the ½-in. Siemans-Martin guy for use.

Boom Extends Usefulness of Fork-Lift Truck

A. P. KEMPLE, Master Maintenance Man
W. L. DAVIS, Senior Maintenance Helper
Ohio Power Co, Brilliant, Ohio

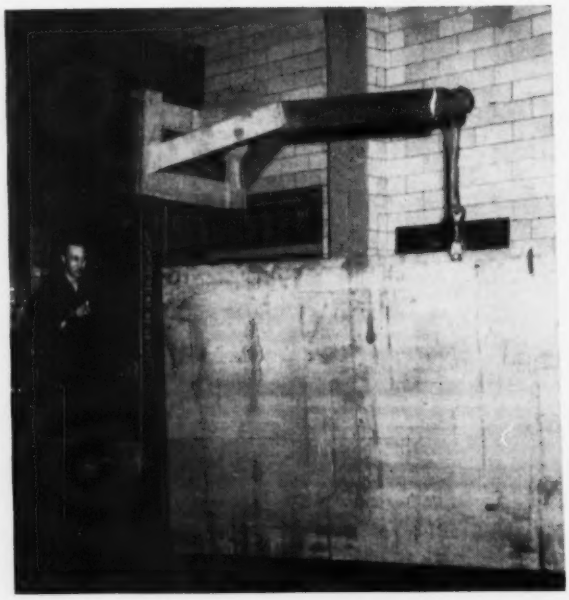
Addition of a boom has more than doubled the usefulness of a fork-lift truck. This was emphasized with considerable savings during a recent generator outage by the following applications:

1. Handled the exciter, thus keeping the crane free for other heavier work.

2. Carried parts from turbine room to machine shop where they could be worked on, thus relieving congestion in turbine room.

3. Supported large air-operated impact wrench for loosening and tightening high bolts and nuts. This avoided building a scaffold so men could hold the impact wrench, or use a slugging wrench and sledge. These alternatives are time-consuming operations.

During normal operation of the plant, the fork-lift truck with boom has a variety of uses. For example, this equipment enabled the set up of a steel-storage rack in a previously unused section of the boiler room, thus taking advantage of wasted space. By lashing planks to truck forks, an easily movable work platform is afforded. It is safer, cheaper, and easier than building a scaffold, especially when the platform has to be movable or adjustable to various heights.



ALL-WELDED BOOM was designed for use with fork-lift truck. Its weight could be reduced by using structural shapes of steel

The fork-lift truck is also invaluable for handling skids, crates, and boxes. Moving heavy chain falls from one place to another has been facilitated with the truck and boom by a cradle.

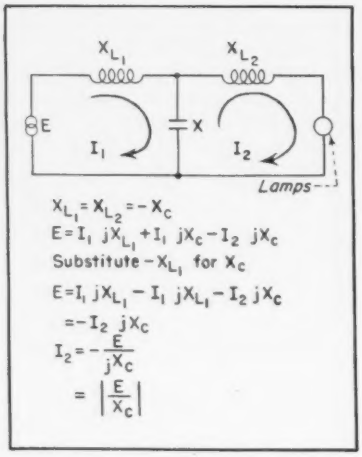


FIG 1—STATIC REGULATOR'S output current is constant and dependent on input volts

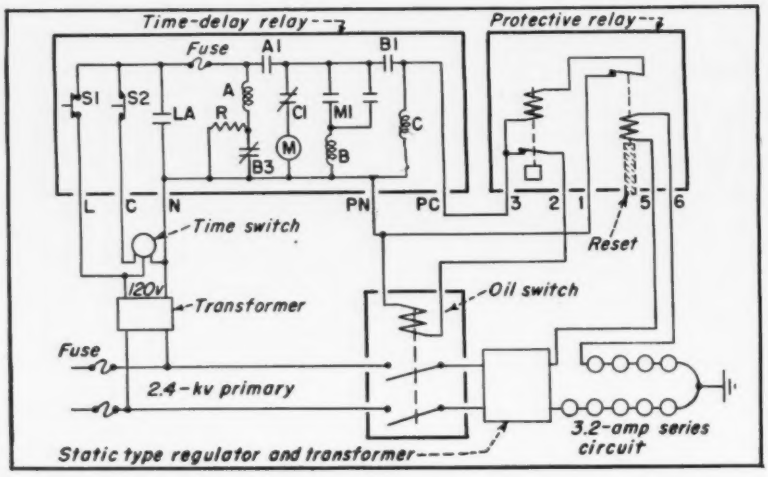


FIG 2—UNIT-BALLAST CIRCUIT eliminates individual ballasts for lamps. Time-delay relay protects film cutouts and prevents lamp re-energization until lamps are cool

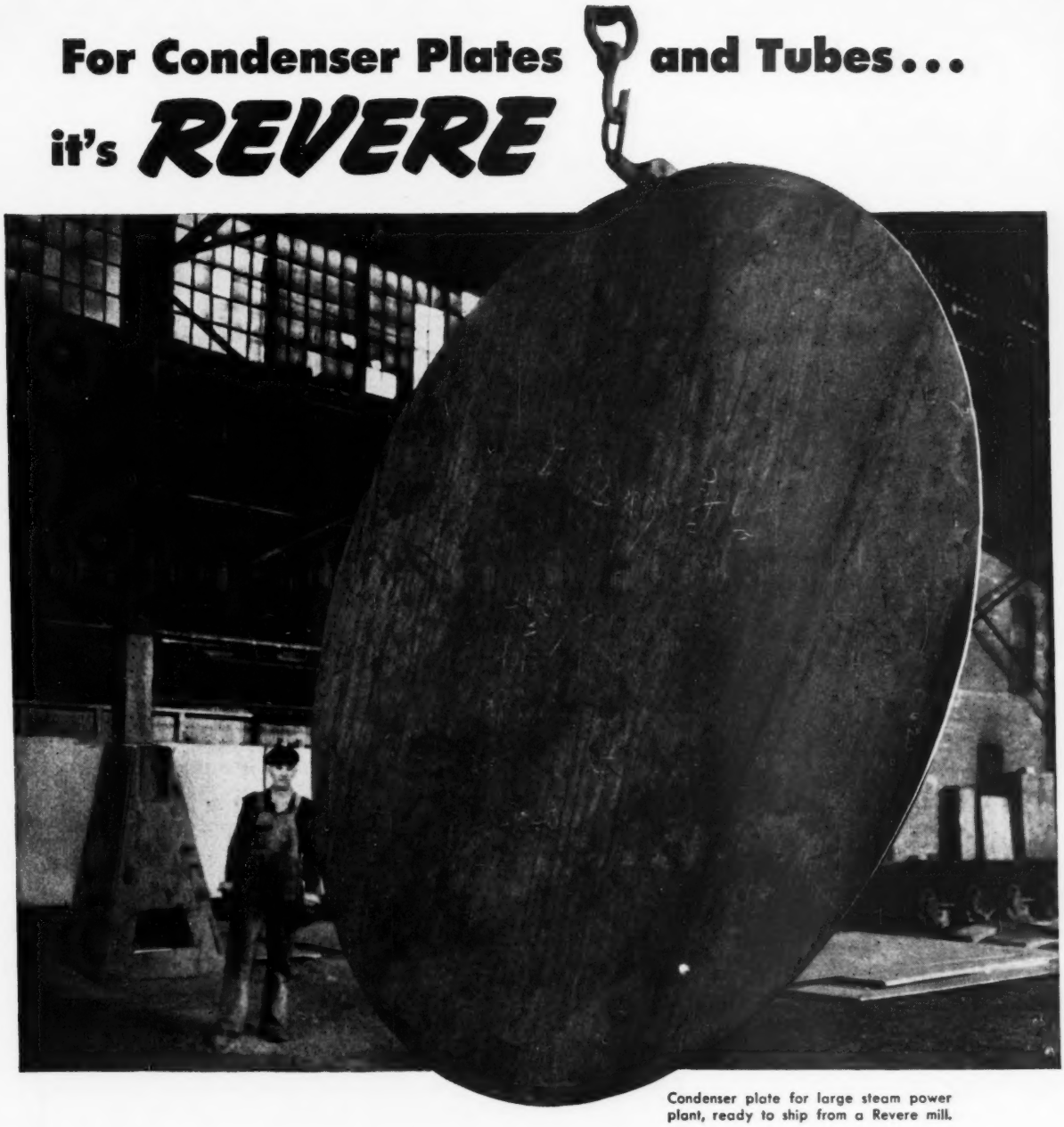
Single-Ballast Street Light System Costs Less

M. C. HARSH, Manager, Lighting Service, Line Material Co, Milwaukee, Wis.

A new mercury vapor street lighting system has been developed by Line Material Co that requires only one ballast on series circuits having loads up to 10 kw. Increased efficiency, higher pf, improved voltage regulation and lower cost are features.

Static Regulator . . . Heart of the system is a static type constant-current regulator having two iron core reactors and a capacitor. These components have equal 60-cps reactances, but the capacitor is of opposite polarity. In the regulator circuit, Fig. 1, the load current, I_2, is dependent upon the input voltage and independent of the load and reactor X_{L_2}, which corrects the power factor.

For Condenser Plates and Tubes... it's REVERE



Condenser plate for large steam power plant, ready to ship from a Revere mill.

In 1808 Paul Revere rolled the copper plates for the boilers of Robert Fulton's second and third steamships. Ever since then Revere has been a preferred source of supply for rolled non-ferrous plates. Today you will find Revere plates in marine and stationary condensers, heat exchangers, evaporators, feed water heaters and similar equipment in ships, chemical plants and refineries, public and private generating stations—wherever long service is essential.

Revere plates, like Revere condenser tubes, are available in all the customary alloys, shapes and sizes. For collaboration in selection of the most durable alloy, consult Revere.

And write on your company letterhead for a free copy of a most informative booklet: "Life Extension for Condenser Tubes."

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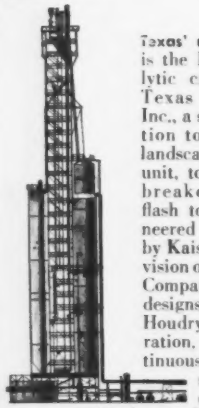
SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

what's NEW in Engineering

An ingenious new alarm system which automatically sounds a warning when overloaded industrial equipment gets too hot, is said to be the answer to the problem of having to feel bearing cases and check thermometers scattered over a wide area. The moment a motor gets "too darn hot", a bulb lights up, and a central monitor gives out an audible alarm.



Texas' newest landmark is the Houdriflow catalytic cracking unit of Texas City Refining, Inc., a spectacular addition to the southwest landscape. The cracking unit, together with visbreaker and vacuum flash tower, were engineered and constructed by Kaiser Engineers Division of Henry J. Kaiser Company from the basic designs prepared by the Houdry Process Corporation. A new-type continuous bulk handling system for fresh catalyst and a new, centralized control system were also designed and built by Kaiser Engineers' process specialists.

To be published January 1, 1954 by McGraw-Hill is the Third Edition of **Formulas for Stress and Strain** by Raymond J. Roark, Professor of Mechanics, University of Wisconsin. This thorough revision of a working handbook for engineers concerned with machine and structural design contains a summary of important formulas, facts and principles pertaining to strength of materials.

An indication of Kaiser Engineers' activity is the fact that more than 6,000,000 miles have been flown by key personnel, staying in touch with far-flung activities in widely diversified engineering fields. When you have a problem in design, engineering or construction, call or write: Kaiser Engineers Division of Henry J. Kaiser Company, Kaiser Building, Oakland 12, California.

Load current is adjusted to 3.2 amp by means of a variable tap transformer.

When the load is disconnected from the output terminals, the circuit becomes series resonant. Only resistance limits the input current, I_l, that produces voltage drops across X_{L1} and X_c that are higher than the input voltage.

The capacitor drop appears at the output terminals of the regulator and is sufficient to start mercury lamps at low temperatures.

Because a hot mercury lamp will not restart after a power failure of a few cycles, a low-voltage time-delay relay, Fig 2, temporarily disconnects the primary from the regulator after a voltage dip of 50% or more. This protects film cutouts by preventing reenergization of lamps until they are cool.

Initial Installation . . . Two single-ballast street lighting circuits were installed in South Milwaukee, Wis., and performance was compared with an adjoining series ballast system. Each new circuit consisted of 19 lamps, a static regulator, an oil switch, a protective relay, a time-delay relay, fuse cutouts, a distribution transformer for the control circuit, and a time clock control. Cost of equipment for each new circuit was $1,674. Equipment for a series-ballast circuit with the same number of lamps would have cost $3.285.

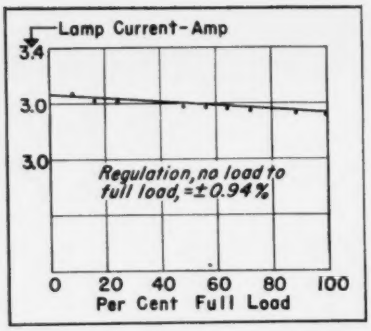
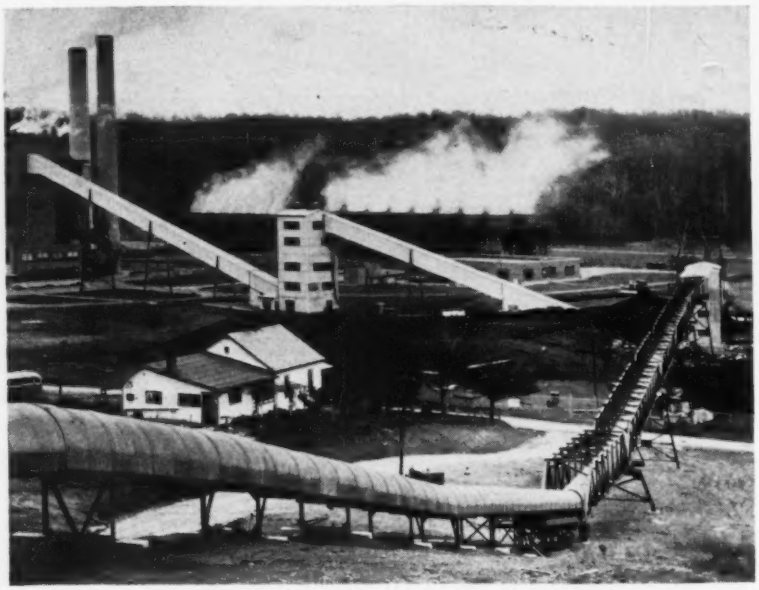


FIG 3—CURRENT REGULATION of 10-kw static type regulator was ± 0.94%

During a year's operation neither single-ballast circuit gave any trouble that could be attributed to system design. Power factor was 95% com-

(*Continued on page* 125)



Mine To Plant Coal Conveyor

Coal is now delivered to Columbus Southern Ohio Electric Co's Poston plant over a belt conveyor that runs from mine tipple to power plant, a distance of 1½ miles. Delivery is at the rate of 2,000 tons of coal a day. This will be increased to 3,600 tons per day as the plant expands.

The belt is 24 in. wide and made of 4-ply cotton duct. With normal use, the belt life is anticipated to be 10 years. The belt is protected from weather by a corrugated steel cover and held in tension with counterweights.

Meet R. F. Lawrence*

Westinghouse Electric Utility Engineer.
On the following pages he and five colleagues show what Westinghouse is doing to help you in . . .

Fighting the battle with the elements

*Bob Lawrence works with utilities in the Southwestern area. He acts as liaison between our district and headquarters' engineers. Along with his broad utility experience, Bob has done considerable work in adapting equipment to specific atmospheric problems —salt air, dusty atmospheres and high ambient temperatures.

"Saul Bennon of the Transformer Division points out why . . ."*

Maximum surge strength is inherent in form-fit design

These broad-surface-area pancake coils are the key to the inherently better voltage distribution and surge strength of the Westinghouse Form-Fit Design.

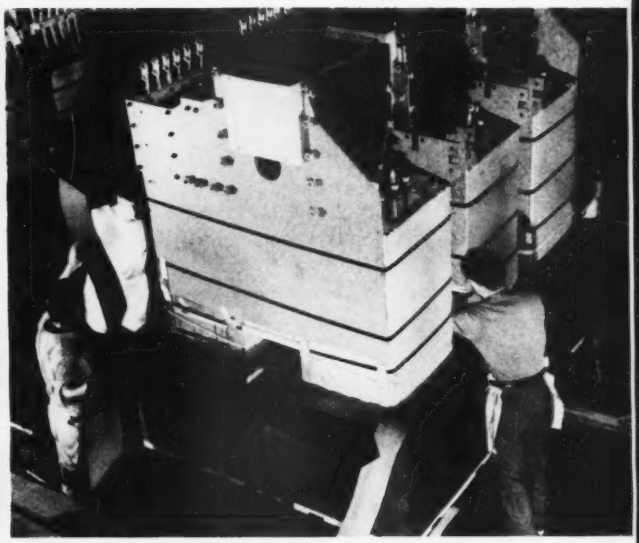
Through the use of relatively few of these broad coils, a high coil-to-coil and low coil-to-ground capacitance is achieved. This capacitance ratio tends to equalize initial voltage drops between all coils of the winding. Thus, voltage does not pile up at the line end and all portions of the winding are equally stressed. The similarity between initial and final voltage distributions also drastically reduces internal winding oscillations and insulation stresses.

The vertical positioning of the coils facilitates the use of interleaved box-type insulation without disturbing the natural flow of the cooling oil. This technique of placing solid insulation along equipotential planes is based upon the knowledge that insulation is stronger in puncture than creep. While this simplified insulation structure materially increases impulse strength, it also permits substantial size and weight reductions.

These and other design features are the underlying reasons why the Westinghouse Form-Fit Design will serve you better under all operating conditions. For further information, contact your local Westinghouse representative or write for Booklet B-4142-A.

J-70704

Building the box-type insulation of a coil group. This technique increases impulse strength while materially reducing size and weight of transformer.



Stacking the supporting and protecting "Hipersil®" core around the coil groups of a three-phase Westinghouse Form-Fit Power Transformer.

Section Manager, Power Transformer Engineering

YOU CAN BE SURE...IF IT'S

Westinghouse

"Bob Bobo, Manager, Switchgear Assemblies, presents some timely information on an important protection problem . . ."

Integrally mounted arresters provide surge protection for metal-clad switchgear

Westinghouse has made comprehensive studies in recent years, the results of which can be very helpful in protecting your metal-clad switchgear against lightning surges.

These studies show that switchgear, when cable-connected to exposed lines, may be stressed beyond its basic insulation level, due to traveling wave reflection phenomena. Lightning arresters provide the proper protection for the equipment and, to be most effective, should be located at the switchgear end of the cable.

For these applications, Westinghouse provides cell-mounted arresters of the type shown. These have high surge capacity and are properly coordinated to reliably protect the equipment insulation.

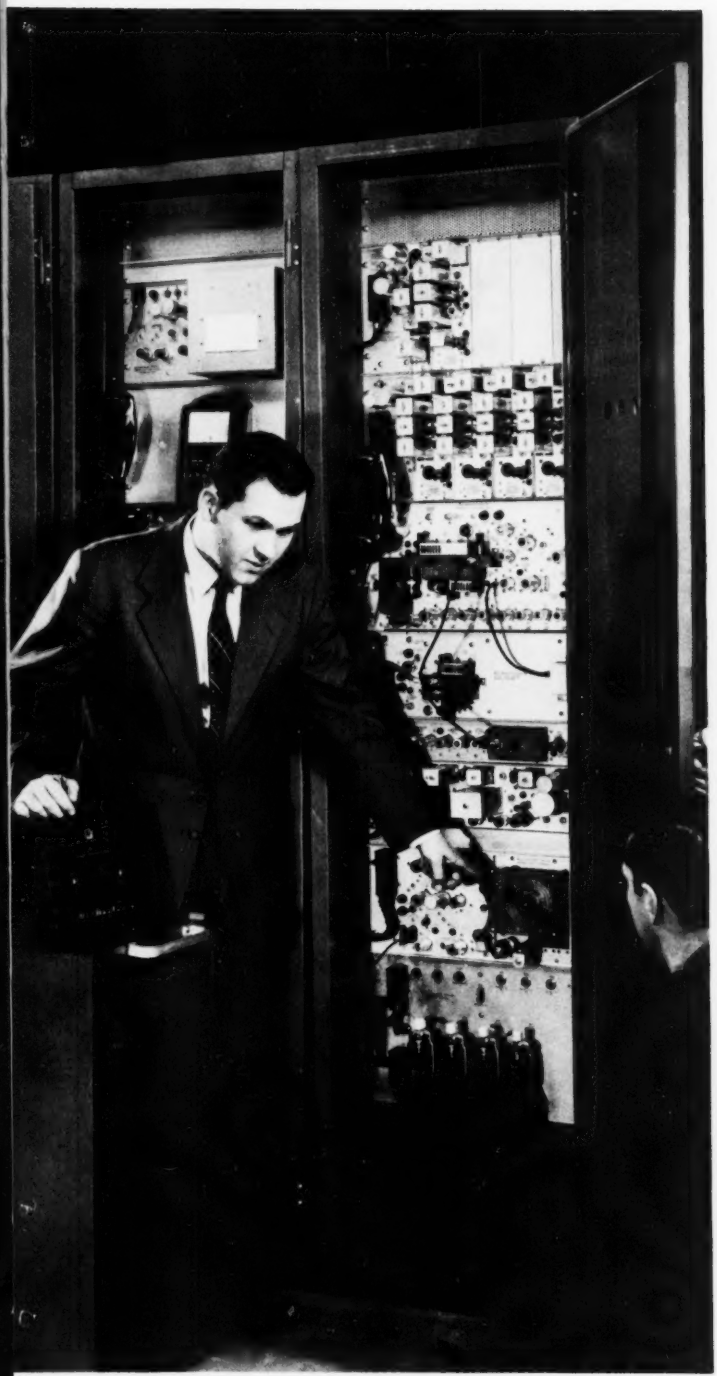
The lightning arresters are tied directly to the line side of the circuit by means of flexible cables. The base provides the ground terminal and a direct path to ground is provided through the arrester base to the ground bus. As you can see here, the lightning arresters are integrally mounted and complete compartmentation is obtained by means of isolating steel barriers. These barriers are easily removed for quick inspection.

Although the assembly shown is typical of outdoor installations, similar applications can be made for indoor metal-clad switchgear.

Contact your nearby Westinghouse representative for detailed application information on this important protective equipment. J-60846

YOU CAN BE **SURE**...IF IT'S

"Nelson Tharp tells you how this microwave communications and control system maintains its high service level during adverse weather . . ."*



This microwave equipment offers stormproof communications

Here's an important development incorporated into the Westinghouse 2000 MC microwave that helps assure reliable communications in all kinds of weather. It's a carefully engineered alarm system that locates and identifies off-normal conditions at any station along the microwave system.

This alarm system reports up to six different off-normal conditions from as many as 31 stations. These are visually indicated by the Remote Alarm Indicator. An audible signal also informs the dispatcher that an irregularity has been registered.

The alarm channel is independent of the 30 voice or 450 telegraphic channels that can be supplied by Westinghouse 2000 MC microwave.

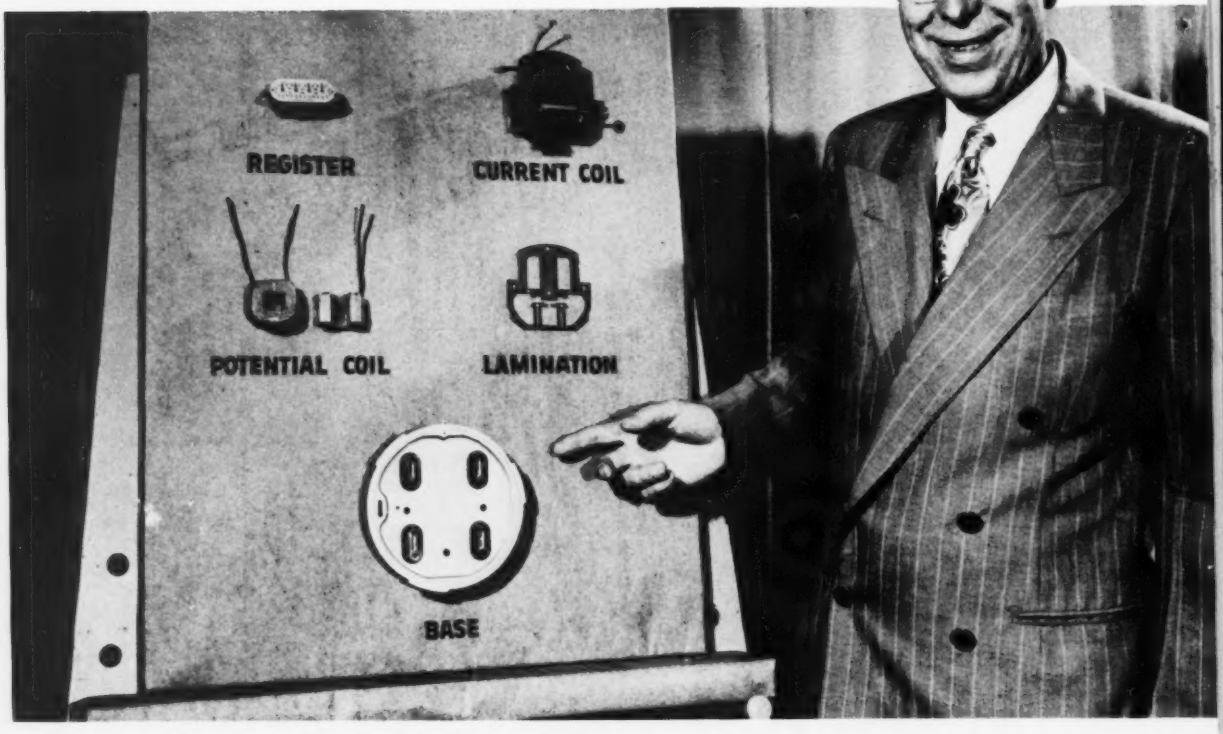
Voice, supervisory control, telemetering, relaying and the many other functions performed over these channels are safeguarded also by the fundamental design. For example: Unit construction with power supply included, and channel frequencies controlled by crystals, combined with frequency-division multiplexing, produce a strict channel independence that means maximum communications reliability.

Westinghouse has had years of experience in the design and manufacture of microwave, power line carrier and end-use equipment and will recommend communications and control equipment impartially. Call your Westinghouse representative or write for booklet B-5850. Westinghouse Electric Corp., Carrier-Microwave Section, 2519 Wilkens Ave., Baltimore 3, Md.

**Microwave Engineering Manager, Electronics Division*

Westinghouse

"Here is Jack Nelson, Meter Application Engineering Manager, to show you how Westinghouse meters are protected from the elements."



How we protect meters from the elements at five danger spots

From sixty-five years' experience building watthour meters, we know which components are the danger spots most susceptible to damage from the elements. Research engineering has concentrated on these danger spots and one by one they have been eliminated. Here is how we did it:

Registers—gold plating is used to provide a positive protective barrier against corrosion for the precision-milled gears and shafts. Friction and wear have been reduced to a minimum in the register by using involute-shaped teeth which have a rolling motion and not a sliding, scraping action.

Current Coils—now insulated with a new material which increased their insulation level three times. This special polyvinyl resin resists corrosive atmospheres and extremes of heat, cold and moisture.

Potential Coils—are completely enclosed and vacuum-impregnated with Laminac, a special polyester resin of extremely high insulating quality. The result—a coil highly resistant to lightning surge voltages, weathering, and faults between windings and to ground.

Laminations—are Bonderized after forming, for positive elimination of corrosion.

Bases—besides being Bonderized, are zinc plated and then given two coats of lacquer to completely protect them against all types of atmospheres.

For more information on how Westinghouse can help you lick your watthour meter battle with the elements, write for a copy of "What It Takes for Long-Time, Low-Cost Metering", Booklet B-4665-A.

J-40453

YOU CAN BE **SURE**...IF IT'S

"Jim Ford of the Transformer Division explains an important 'all-weather' feature . . ."*

Here's proof that this transformer finish lasts twice as long

One of the continuing projects at Westinghouse for the past several years has been the perfection of a transformer finish that would have double the life of standard paints . . . under any weather or atmospheric conditions.

The result, known as "Coastal Finish", is now being used on all Westinghouse pole-type distribution transformers. That this patented three-coat finish is resistant to all weather and atmospheric conditions is proved by several severe laboratory tests as well as actual field installations under the most severe coastal, industrial and desert conditions.

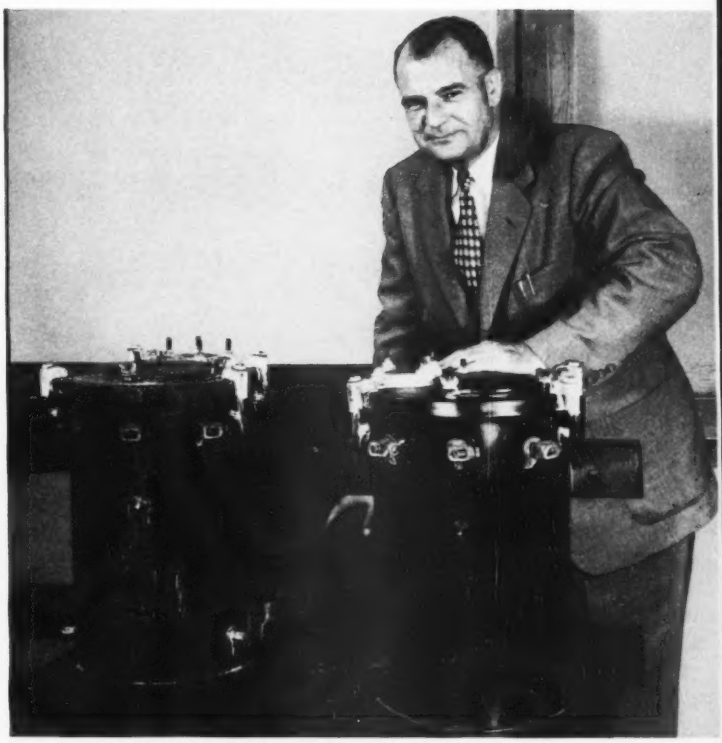
For instance, the Weather-O-Meter test (bottom illustration) exposes paint panels to periodic cycles of one hour in fog and three hours under ultra-violet light. Two weeks' exposure to this test is equivalent to one year of actual field exposure. Another such test is the salt spray test (results shown in top illustration) in which transformers are subjected to 1000 hours of continuous 15 lb. pressure spray containing a saturated salt solution.

Such tests, and others equally severe, assure you of a transformer finish designed to last the life of the transformer . . . eliminating rust, corrosion and expensive change-outs for repainting. You may expect even better paints in the future because Westinghouse is continually striving to find better ways to aid you in your battle with the elements.

For more complete details on Westinghouse "Coastal Finish" call your Westinghouse representative. Or—write now for Distribution Transformer Sales Letter No. 40. J-70703

*Manager of Manufacturing Engineering

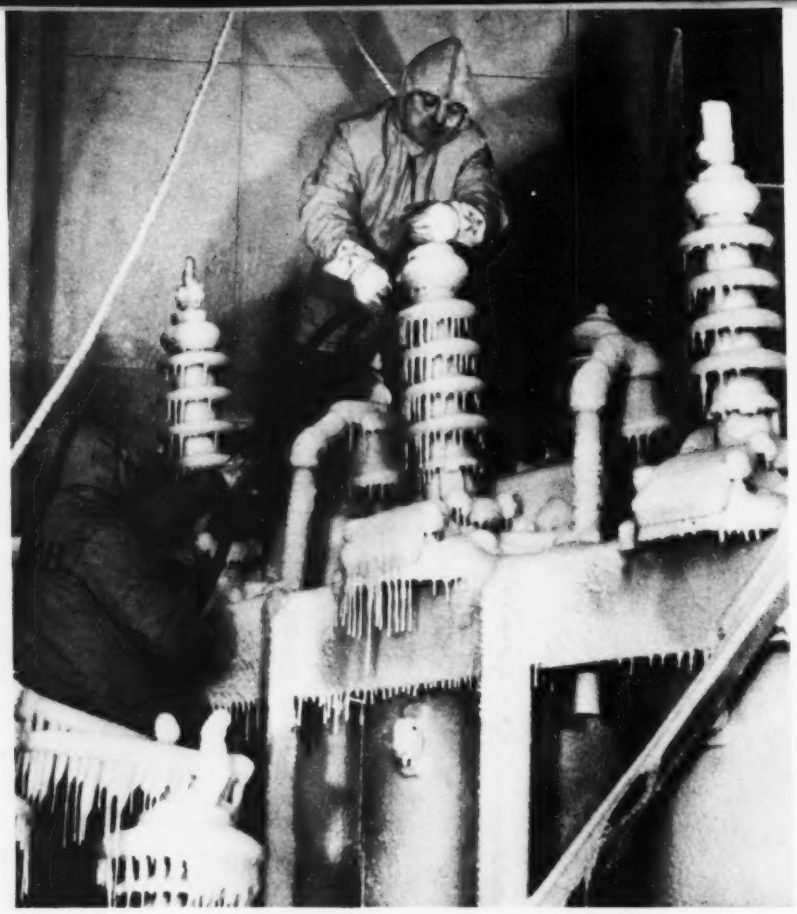
Westinghouse



A standard finish and "Coastal Finish" (right) transformer after being exposed to 1000 hours of salt spray.

Westinghouse Weather-O-Meter paint test which simulates average conditions of fog, rain and sunshine.

"Half the battle with the elements is won right in the laboratory where nature's worst is duplicated. Here's news about Westinghouse testing facilities."



We keep rain, wind, sleet and lightning on tap in laboratories throughout the country

Westinghouse products that help you fight the battle with the elements are not released until they prove they can take it in one or more of the company's 200 engineering laboratories. Here, elaborate equipment is used to duplicate within the laboratory a hundred or more varieties of weather. At any one time, it is possible that Westinghouse engineering laboratories are simultaneously subjecting equipment to rain, sea spray, sunlight, heat, dust, hurricane wind, tropical humidity, sleet, snow, earthquake and lightning.

Much of the test equipment is of special interest to the electric utility industry. For example, the Westinghouse High Power Laboratory has, as part of its regular test facilities, a cold room complete with refrigerating equipment and water sprays to produce sleet, ice and sub-zero temperatures down to -20°F for testing various switchgear equipment. The above photo shows equipment undergoing a cold test which in many cases is more severe than actual operating conditions.

Simulating nature is only one of the assignments of the engineering laboratories. They are an important element in the equipment design process—for only by laboratory tests can drawing board concepts be proved.

Perhaps one of the Westinghouse engineering laboratories has already discovered the answer to some equipment problem that is troubling you right now. If so, discussion of the problem with your Westinghouse representative will bring you answers that will save you time and money. CP-13 (1012)

• • •

For more information on the products described here, write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

YOU CAN BE SURE...IF IT'S

Westinghouse

Street Light System

(*Continued from page* 116)

pared to 38% for the adjoining circuit, regulator load factor was 76% compared to 40%, and the efficiency was 94% compared to 92% for the moving-coil regulator operating at half load.

The regulator is designed for 2.4 kv and can start lamp loads up to its design capacity. Thermal characteristics, rather than no-load voltage characteristics, determine the regulator's capacity. Current regulation is ± 0.94%.

S. F. Chronicle

BORING MACHINE bores hole and pushes pipe under street, eliminating traffic problem

Boring Machine "Lays" Pipe

A new boring machine, used by Pacific Gas & Electric Co, pushed a 42-in. diam pipe under a mid-San Francisco street without interrupting traffic. This procedure was more costly than digging a trench across the street but was valuable because excavation would have interfered with heavy traffic.

The hydraulic machine, developing a 250-ton force, pushed 12-ft sections of pipe through the sandy soil 20 ft underground. A trench was dug on each side of the street; the auger was fitted into the pipe sections, and they were pushed forward simultaneously. As each pipe section was placed, it was welded to the adjoining section from the inside.

The pipe will carry 12 cables and is part of a program to develop a grid of circuits to assure service continuity.

Another new development using

B. F. Goodrich Chemical ***raw materials***

B. F. Goodrich Chemical Company does not make this cable. We supply the Geon materials for the jacket only.
U. S. Army Photograph

Skinnier Cable is Stronger— Carries More Talk!

JUST think, this cable used by the Signal Corps carries 12 two-way telephone conversations at the same time, compared to 4 messages in the World War II type! On top of that, it weighs ⅓ less, is ⅙ less in diameter, has better electrical properties and improved resistance to jolts, bangs and abrasion —largely due to its Geon jacket!

And here's where the taxpayer cheers. With all these improvements, it costs ⅓ less than the cable it replaces!

Spiral-4 cable is protected by an extruded jacket made of Geon vinyl materials which give it light weight, ease of handling in *all* climates and its wonderful abrasion resistance.

Credit these many advantages to Geon materials, which have helped make many products sales successes —and cut costs, too. Geon materials come in several forms—resin, plastic granules and liquid latex. They can be used for molding, coating, casting or dipping . . . are resistant to heat and cold, abrasion, oils, greases and most chemicals.

For information about Geon materials, and how they may help you improve or develop more saleable products, please write Dept. GJ-12, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

GEON RESINS • GOOD-RITE PLASTICIZERS...the ideal team to make products easier, better and more saleable
GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors

PROPER lighting was dramatized in a lighting skit during "Hit Parade of 1953." Starring were sales representative L. L. Barthelemy and Marjorie Keller, home service representative

Lighting Campaign Adds $300,000 EAR

JAMES E. FORT, Advertising Department, Louisiana Power & Light Co

Louisiana Power & Light Co recently concluded an 8-week lighting campaign, which proved to be outstanding in the company's history of successful promotions. "Hit Parade of 1953" accomplished two major aims. It added more than $300,000 in additional estimated annual revenue and it greatly enlarged the educational scope in proper lighting among the customers of its service area of 44 parishes in Louisiana.

Among residential users alone, the campaign provided an additional $258,000 in EAR. This was figured on the basis of the 5,505 written lighting layouts prepared and presented to customers. These layouts should account for 1,100 kw while another 7,500 kw of additional annual load is expected from the more than 100,000 light bulbs given away during the campaign. But residential revenue was not the only factor involved in the campaign. Approximately $55,000 in additional annual revenue was picked up in the commercial field. This brought out total revenue hike in the campaign to $313,000 annually.

All Employees Helped . . . One of the keys to success of the campaign was that it was not restricted to sales personnel, but incorporated the efforts of all employees of the company. Meter readers and service men assisted by screwing in light bulbs where they were most needed, and cashiers and clerks helped by giving brief lighting stories to customers when they came in to pay their bills.

Dealers Benefited . . . Dealers throughout the company's service area have continued to praise the efforts of the campaign, and many of them point out that they are still receiving benefits from the big promotion. Customers continue to talk to them about better lighting, and many of these have made arrangements for fluorescent lighting in their homes or additional lighting facilities and indirect and decorative lighting.

The educational aspect of the campaign was not to be overlooked. One customer reported to the company recently that her young daughter continually "checks" on her parents and brothers and sisters to make sure that they have enough light for whatever job they may be doing.

In schools throughout the service area, lighting skits were presented which got over the lighting story in clever, and often amusing ways. Sprinkled in these skits were "magic wands," "glow worms," and other stage items which interest children.

Light-Conscious Dealers . . . Dealers throughout the service area also became more "light-conscious." The campaign proved, in many instances, that sales of lighting equipment could be among the most profitable items in their stores. As a result, many dealers are providing more space for their lighting displays and fixtures than they have in the past.

Future Campaigns . . . The company does not intend to leave the lighting picture as it is. It realizes that future campaigns will be necessary to keep customers thinking about better lighting. Thus, the company is starting another campaign and probably will sponsor two large promotions in 1954.

Some Campaign Figures

EAR (Residential)	$258,000
EAR (Commercial)	55,000
150-w lamps given away	103,849
Written layouts prepared	5,505
Group meetings held	1,466
People attending meetings	70,556
Sales allies	2,058

Westinghouse Fetes 4-H Club Winners

Chosen from some 100,000 participants in the 4-H Farm and Home Electric Program sponsored by the Westinghouse Educational Program, 36 boys and 7 girls are Westinghouse guests at the 4-H Club Congress now in session in Chicago. At an awards banquet, Dec. 1, six of these winners will be crowned National Farm and Home Electric champions and receive $300 college scholarships.

Electrical projects built by the enterprising youngsters range from hotbeds and brooders that increase farm production to safety and convenience devices, hay elevators, water pumps and other labor-saving equipment.

Specify ANDERSON

LC50 - LC500 - LC70B SERIES

Aluminum CONNECTORS

For WIDER APPLICATION on Aluminum Distribution Systems

These Anderson Connectors will eliminate the large assortment of types and sizes you are now using—*and still give you a wider range of application.* They save costs . . . reduce truck inventory . . . save time on the job.

CATALOG NO.	MAIN	TAP
LC-51A	No. 6—1/0 ACSR	No. 6—No. 2 ACSR
LC-52A	No. 6—1/0 ACSR	No. 6—1/0 ACSR
LC-511A	No. 6—1/0 ACSR	No. 8—No. 2 COPPER CABLE
LC-522A	No. 6—1/0 ACSR	No. 8—1/0 COPPER CABLE
LC-70B	No. 6—No. 2 ACSR	No. 6—No. 2 ACSR
LC-71B	No. 6—1/0 ACSR	No. 6—1/0 ACSR

ABW DESIGN MEANS QUALITY *Plus* STRENGTH in the RIGHT PLACES!

Consult one of our nearest 20 representatives or contact our main office.

Aluminum & Bronze POWER CONNECTORS • CLAMPS • FITTINGS • ACCESSORIES for SUBSTATION • TRANSMISSION • DISTRIBUTION SYSTEMS *for over a Quarter Century*

ANDERSON BRASS WORKS, INC.

P. O. DRAWER 2151 • BIRMINGHAM 1, ALABAMA

Range Sales Hot During Summer Frolic

MARGUERITE SURLES, Home Service Director, Carolina Power & Light Co, Raleigh, N. C.

When the dust had settled, Carolina Power & Light's "Summer Frolic" range campaign had racked up 5,029 sales. This figure, as contrasted with 3,704 sold during the same period last year, an increase of 36%, provided, it was felt, something to talk about, particularly since the national figure on range sales this year had indicated a downward trend over 1952.

The campaign gave a decided boost to the 52% range saturation on the company's territory.

Two-Month Campaign . . . During a two month period, which coincided with the national range promotion of manufacturers, company and dealer personnel, distributors and contractors fired on customers with all the "big gun" range promotions that could be thought up.

The quota for the campaign was 20 ranges per thousand residence customers for each of the company's five divisions. Twelve distributors in North and South Carolina participated in the campaign and provided a prize money kitty for dealers and dealer salesmen.

Six prizes were set up. Each was a week's rent-free use of a cottage at the beach. These prizes were awarded as follows: In each company division (Northern, Eastern, Central, Southern, Western) the dealer or dealer salesman who individually sold the greatest number of electric ranges per thousand electric residence customers in his county, as shown by the 1950 census, won the rent-free beach cottage for a week.

The sixth similar prize was awarded to the dealer or dealer salesman who individually sold the greatest number of electric ranges during the campaign period regardless of his location.

Names Supplied . . . Dealers were supplied with names and addresses of customers in the "range buying zone." They were customers whose kwhr consumption fell between 70 and 125 per month.

Company salesmen and home service representatives were available on a first-come, first-served basis to dealers for conducting demonstrations for groups of customers.

Blanks were furnished to dealers for weekly recording and mailing of sales to the company's residential and rural sales manager.

As Smiley told dealers in his letter to them announcing details of the campaign:

"Everybody is playing against par, with the exception of one prize which is against the field." Since each distributor could have only one winner, the sales forces throughout the whole area for any particular distributor were in competition with each other to see which one was the best salesman of the brand. In addition, the best salesman of each distributor was in competition with the best salesmen of all other brands since there were more brands represented than there were prizes.

Floodmobile contributed and manned by Atlantic City Electric Co is . . .

Carrying the Lighting Theme

A floodmobile lighting unit is being used to sell floodlighting to Atlantic City business people in anticipation of the city's 100th anniversary, and the electric industry's Diamond Jubilee of Light. Both events will be celebrated in 1954.

The unit is the result of efforts by three local wiring jobbers who supplied the lighting and switching equipment, four prominent electrical contractors who assembled it, Atlantic City Electric Co, which supplied the half-ton truck, and the utility's lighting staff. The latter group takes the unit to various business houses and demonstrates how prospects can floodlight their building fronts, and how the buildings will appear when properly lighted.

The truck carries 15 types of floodlights ranging from 150 to 1,500 w. They may be operated from the truck or may be removed to other locations.

Requests for use of the floodmobile by various commercial customers were initiated by a series of three mailing pieces previously sent out calling attention to the availability of the demonstration equipment.

All-Wars Memorial Building was the first structure which had a test with the floodlighting. Hotels, stores, churches, restaurants, and night clubs are among the many buildings already lighted for the celebrations.

Roeplastic control cable—

THE ONLY CONTROL CABLE WITH CIRCUITS *POSITIVELY* IDENTIFIED

THIS NEW Roebling ROEPLASTIC Control Cable makes circuit identification quick and certain for the first time in history. A workman can't go wrong even if he's color blind. Here's why:

In ROEPLASTIC Control Cable, each conductor is identified from end to end by both its IPCEA code color name and its individual number by means of an indelible printing against a strongly contrasting background. The printing is permanent; it cannot fade or rub off... identification is always positive whether plans show circuits by color code or by numerals.

Roebling ROEPLASTIC Control and Signal Cables are ideal for such purposes as remote control of motors, switch gear, automatic machinery, etc.... for traffic light control, relay, metering and supervisory circuits. They are made in constructions, types of insulations and over-all sheaths to meet every specific requirement. Write for technical data... and order ROEPLASTIC Control and Signal Cables from your Roebling distributor. John A. Roebling's Sons Corporation, Trenton 2, N. J.

Subsidiary of The Colorado Fuel and Iron Corporation

ROEBLING

ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. & 5 PITTSBURGH ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • ROCHESTER, 1 FLINT ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • ST. LOUIS, 3001 DELMAR BLVD. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, NEW JERSEY

CF&I

DIFFUSED LIGHT provides a maintained illumination level of 225 ft-c on sorting tables without glare or heat. Ultraviolet light under hood decontaminates small metal parts, reduces danger of infection

Light Decontaminates Parts, Increases Efficiency

Decontamination of small parts and elimination of eyestrain and fatigue for employees sorting these parts are benefits of an industrial lighting installation at Industrial Aids, Inc, Compton, Calif. Installation includes an industrial type of four-tube slim line fixture and ultraviolet fixtures.

RICHARD HATFIELD, Lighting Consultant, Southern California Edison Co, Compton, Calif.

Chief activity at Industrial Aids is the reclaiming and sorting of small parts, such as nuts, bolts, rivets and screws, for aircraft plants in southern California. Metal parts are contained in floor sweepings from these plants and are accompanied by loose paper, cigarette butts, wads of gum and other debris.

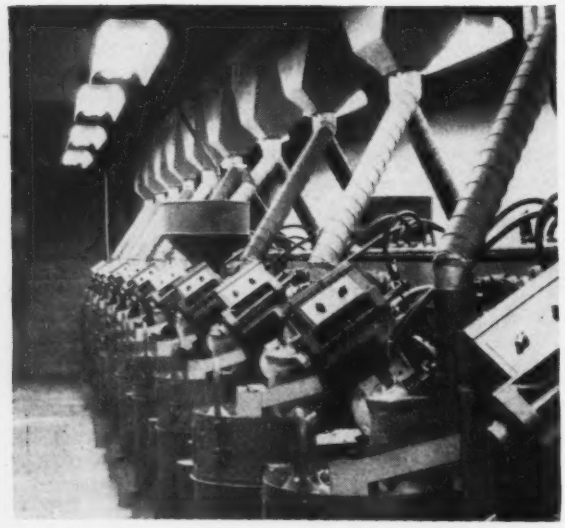
First problem was to light sorting tables across which metal parts travel after being mechanically removed from sweepings. It was necessary to design a lighting system that would allow sorters to detect minute differences in detail among rapidly moving parts. Reflections from glossy, metallic surfaces also had to be minimized.

An industrial type of four-tube slim line fixture, corrected with a corrugated translucent plastic diffusion panel, was installed. Unit provides a high-intensity light (230 ft-c with a calculated maintained level of 225 ft-c) without producing glare or harsh shadows. It also minimizes radiated heat and "strobe" effect. Brightness is limited to 3:1 ratio in the immediate visual field and 10:1 ratio in general area of view.

Second problem was to decontaminate parts in an efficient manner which would be psychologically acceptable to workers. Passing parts through an antiseptic bath would give them an undesirable odor and result in corrosion due to moisture. Therefore, ultraviolet units were chosen.

Dual, high-intensity hooded unit is installed over the initial sorting belt outside the main plant. Smaller, individual ultraviolet units are installed over and at the head of each final sorting belt. Their presence serves to remind workers that metal parts are being continuously decontaminated. Hence, workers are willing to handle the parts more readily.

Electronic Sorting Improves Coffee Quality



OLIVER V. BALDWIN, Industrial Representative, New Orleans Public Service, Inc

Electronic sorting of green coffee at Otis, McAllister and Co, coffee importers and general exporters, New Orleans, La., improves the coffee quality by removing extraneous matter and defective beans.

Incoming coffee is sorted, graded and bagged in the New Orelans Free Trade Zone. This has all the advantages of carrying on these operations in the country of origin plus those of having readily available here adequate power, technical knowledge, spare parts, and supervision.

The coffee is first passed through electrically operated screens to catch oversized beans and foreign matter. Electro magnets, operated in conjunction with these screens, attract any metal particles mixed in with the beans.

The beans are then conveyed to a bank of electronic coffee-sorting machines where they are automatically fed onto a rotating disc. The beans are individually picked off the disc by means of small suction cups and then passed in front of an electric eye for grading. As each bean

WE MAKE OUR OWN RAIN . . .

Victor No. 245-R Transmission Pintype undergoing standard EEI-NEMA wet flashover test in the Victor Laboratory.

TO GIVE YOU

PROVEN WET WEATHER PROTECTION

The superiority of Victor design and manufacture is proven in the laboratory as well as in the field. Take Victor High Voltage Pintypes, for example. Here, in the wet flashover test shown above, the insulator is being subjected to controlled artificial rain while 60-cycle current is applied in gradually increased voltage steps until flashover occurs.

This is only one of the many tests which are constantly being made in the Victor Testing Laboratories to assure you of highest quality and conformance to specifications. That is why Victor Transmission Pintypes give you proven wet weather protection and longer, trouble-free service on your lines. Choose Victor — the power man's best buy!

VICTOR No. 245-R
EEI-NEMA Class 56-3

FREE BOOKLET gives you the full story of how Victor Insulators are made — how and why Purified Porcelain was developed. Write us for your copy.

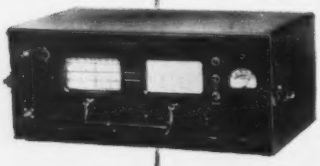
Specify VICTOR INSULATORS!

VICTOR INSULATORS, INC., VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains • Spools • Switch and Bus Insulators • Custom Designed Porcelain

Power Line
RADIO & TV
Interference Sources Located . . .

QUICKLY & EASILY!



Sprague's Interference Locator is the ideal portable instrument for fast, easy location of noise sources on power lines and electrical equipment.

Compact, rugged and easily operated, the 8-tube superhet circuit covers frequencies from 550 kc to 30 mc — operates from self-contained dry battery, auto battery or 115-volt mains. Features include loop and collapsible rod antennas, integral loud speaker, built-in dual range output and battery test meter, calibrated r-f and audio gain controls, and beat-frequency oscillator. Write for Bulletin PF-601 to:

SPRAGUE ELECTRIC COMPANY
315 Marshall Street,
North Adams, Mass.

SPRAGUE
Pioneers in Electric & Electronic Development

passes the electric eye, it transmits a signal to the cathode tube. Intensity of the signal is governed by color of the bean. Beans of secondary grade are rejected into containers while those of better quality or the acceptable classification are passed to a different set of containers.

The electric load involved in this operation is approximately 40 kw.

Edwin L. Wiegand Co

HEATER BANK suspended over gear casting molds on conveyor dries silicone wash in 7½ min replacing overnight air drying. Conveyorized method saves handling labor and floor space normally required to stack molds for air drying

Infrared Speeds Mold Drying

Ohio Steel Foundry, Springfield, Ohio, has replaced overnight airdrying, and now dries silicone wash on molds for gear castings in 7½ min with infrared electric radiant heaters. Conveyorized production is now accomplished without interruption, and smoother gears are produced with less casting-cleaning labor. Single bank of 24 heaters, rated 1.8 kw each, is suspended over conveyor carrying molds. During drying, heaters are lowered to within few inches of tops of molds, but when not in use can be raised to ceiling.

Only drag half of each mold is sprayed with silicone wash in this operation. The cope is not sprayed because it contains very little cavity and none of the gear tooth surface. About 25 drag molds are dried per hour. After drying, molds are cooled by a fan at end of heating line. This prevents condensation from forming and permits immediate mounting of cope and pouring of mold.

INDUSTRIAL BRIEFS

Refrigerating trucks at Borden's Dairy Co, Portsmouth, Ohio, with an electric motorized refrigeration unit assures customers of receiving their dairy products at just the right temperature, whether they are first or last on the delivery route. Each truck is equipped with an electric-driven unit which freezes a chemical solution while truck is on the parking lot at night. Thawing of this solution, while deliveries are being made during the day, maintains temperature within truck at very nearly 38 F all day. The retail delivery trucks are equipped with 1-hp, 3-phase, 230-v compressors, while the larger wholesale trucks have 2-hp, 3-phase, 230-v compressors. All re-

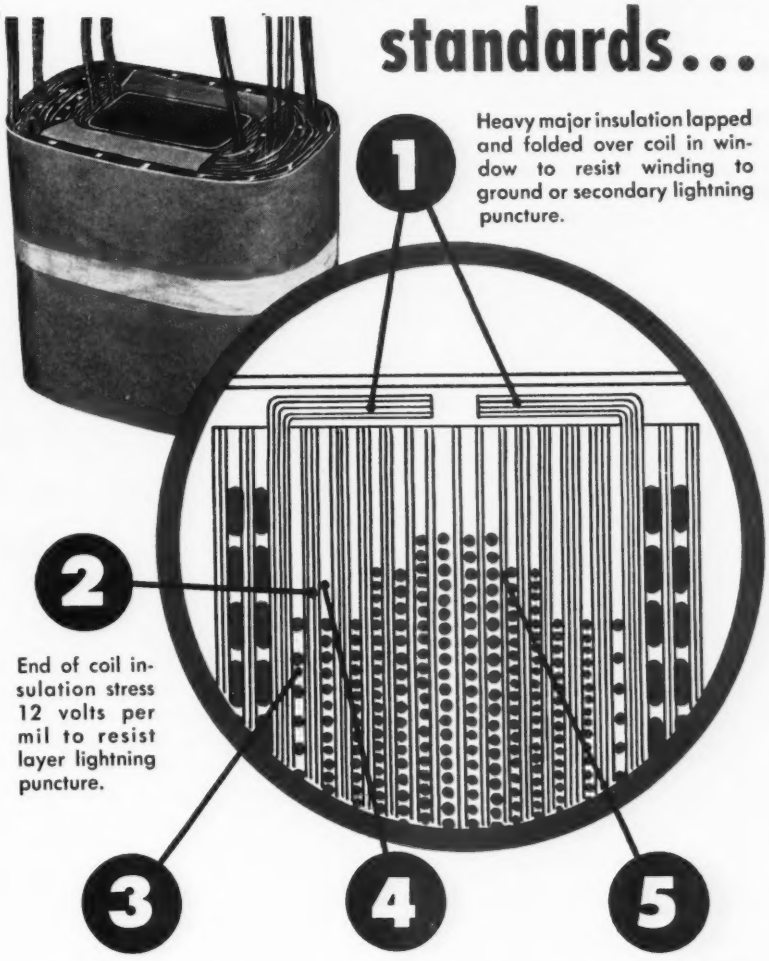
ceptacles and all refrigeration units were made 3-phase for flexibility. W. H. Walter, Industrial Power Eng, Ohio Power Co, Portsmouth, Ohio.

Good lighting and air conditioning at Superior Dairy, Inc, Canton, Ohio, produces the anticipated results of more output per manhour, fewer errors, less fatigue, etc. Office is now comfortable. Less absenteeism is encountered and better employer-employee relations exist. 7.2 kw of fluorescent lighting in the offices produce 85 ft-c required by difficult seeing tasks. Previously during the peak summer heat, the office, although well insulated, was very uncomfortable. At that time, local suppliers were sold out of air conditioning units. Early this year a 5-ton self-contained air conditioning unit was installed. G. W. Craiglow, Industrial Power Eng, Ohio Power Co, Canton.

Ventilating a compressor room at Superior Dairy, Inc, Canton, Ohio, in which the main service entrance along with control panels, switches, etc, are mounted on the inside wall, permits proper sized protection on electrical equipment and interruptions are eliminated. Normally, thermal overload protective equipment must be derated when operating in high ambient temperatures. As compressor load increased with expanded business, frequent operations of thermal relays, unjustified by load, occurred causing considerable loss in production and money. This condition was eliminated by installation of a 3-hp, 36,000-cfm fan in roof of room above switchboard. Ambient temperature dropped between 25-30 F. G. W. Craiglow, Industrial Power Eng, Ohio Power Co, Canton.

Heating paint in an electrically heated paint bath has resulted in improved and uniform painting at F. H. Lawson Co, Cincinnati, Ohio. Paint coverage of the product has been complete and ridges and drips have been eliminated. Two 3-kw, 230-v, 1-phase, 60-cycle immersion heaters are used to heat bath in the paint dipping process. Two thermostats are used for control of heaters—one to maintain the paint bath at a constant temperature and the other to act as a limit switch and cut off power in case of failure of regulating thermostat. L. J. Langevin, Power Engineer, Cincinnati Gas & Electric Co.

WHY RT&E transformers have impulse levels 150-200% NEMA standards...



1 Heavy major insulation lapped and folded over coil in window to resist winding to ground or secondary lightning puncture.

2 End of coil insulation stress 12 volts per mil to resist layer lightning puncture.

3 End layer space wound to resist turn to turn lightning failure.

4 End of coil layers spaced back from coil edge to resist winding to ground lightning puncture.

5 Center of coil insulation stress 40 volts per mil — taps located at coil centers and remote from lightning entrance points.

Impulse tests to destruction show levels of 150% to 200% of industry standards.

All R T & E coils are varnished, baked, vacuum dried and oil impregnated for insulation resistance in excess of 10,000 megohms.

When you buy, specify **R T & E**

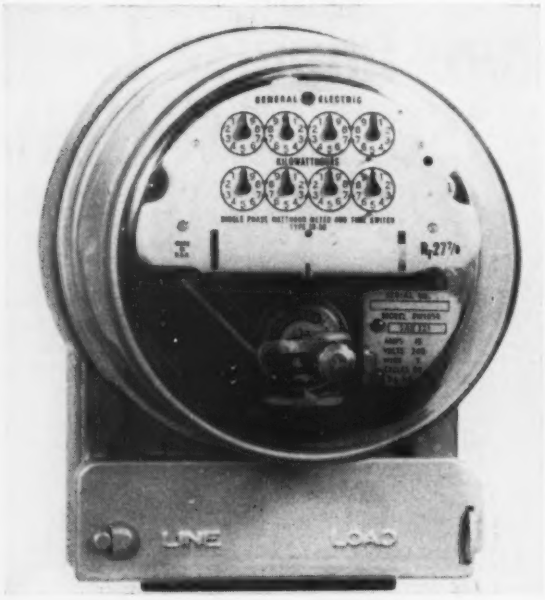
WRITE FOR CATALOG

632 N. 8TH ST. MILWAUKEE 3, WISCONSIN

RT&E Co.

BRANCH PLANT: WAUKESHA, WISCONSIN

NEW EQUIPMENT



Meter and Switch

A new combination watthour meter and time switch, designed to control off-peak water-heater loads, has been announced. Type IR-50 utilizes the features and advantages of the Type I-50 single-phase watthour meter. The time switch is a completely separate assembly from the watthour register and either of the two basic components can be removed without disturbing the other.

The meter is available with a single-rate register for registering only the off-peak water-heater load. It is also available with a double-rate register for registering the total load on one set of dials and the house load alone on the other set during on-peak periods. Both meters have 40-amp contacts and can be supplied with either single-pole, single-throw or double-pole, single-throw switches.

Resetting either set of dials, for the double-rate register, is accomplished by depressing one of two reset plungers. Resetting plungers are located on the outside of the cover and can be sealed or locked. When either set of dials is not engaged with the meter shaft, that set is securely locked to prevent false registration due to vibration.

General Electric Co, Schenectady 5, N. Y.

Switch Attachment

A new quick-break horn attachment, called Arc Restrictor, has been announced for interrupting line charging current and transformer magnetizing current. It can be attached to any R&IE standard single break, double break, or vertical break switch up to 115-kv rating.

The horn attachment on the blade is flexed, while carrying current, to a point just prior to the break position, at which time it develops very high speed. A dampener is provided to prevent restrike on a possible horn rebound. Tests reportedly show that no visible arc is produced when switching 30 miles of 66-kv charging current, and 20,000 kva of transformer magnetizing current.

I-T-E Circuit Breaker Co, Greensburg, Pa.

Electronic Telephone

A new electronic telephone designed for noise-free communication in extremely noisy plant areas has been announced. The GAI-Phone is operated in the same manner as the standard telephone and connects to an existing telephone circuit. A 110-v, 60 cps source is required for each new phone.

A special close-talking, dynamic transmitter in the handset provides a high order of discrimination against surrounding noise and high quality voice transmission. The telephone's receiver and transmitter volume levels can be adjusted for most effective operation in individual locations. This also permits its use as a "terminal repeater" station.

Another feature of the phone is controlled automatic elimination of sidetone. This reduces to below audibility the amount of noise that is picked up on the transmitter.

Gai-Tronics Corp, Reading, Pa.

Oil Reconditioner

A portable oil reconditioning plant that can be hooked up to an energized transformer has been announced. It is capable of purifying 1,800 gal of oil per min and consists of a cartridge-type filter and a vaporizer with necessary controls and piping.

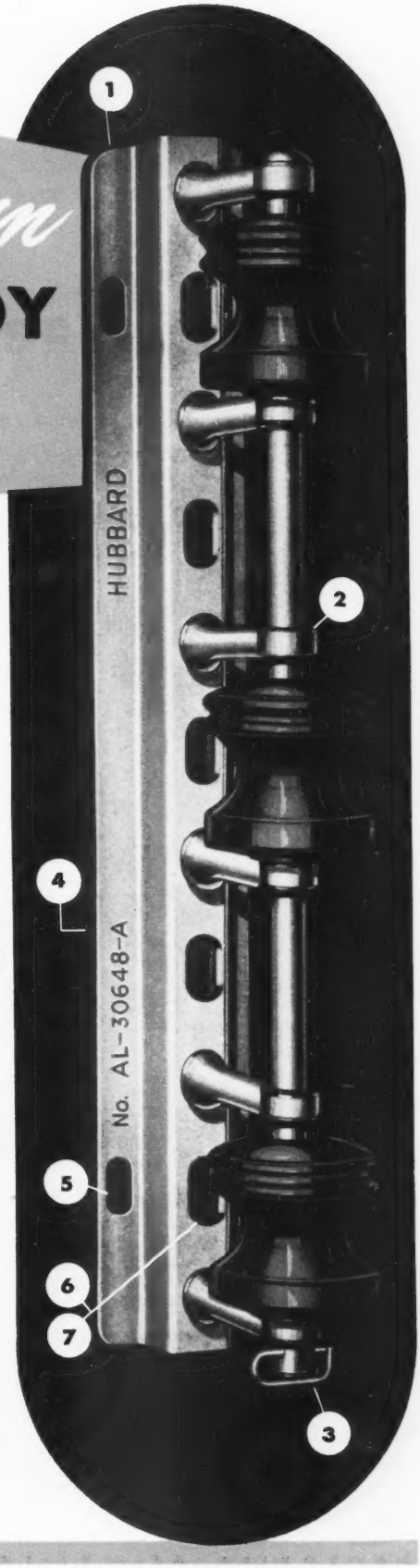
Impure oil passes through a Fuller's earth filter where all insoluble matter is removed. The filtered oil is drawn into the vaporizer where solubles are extracted, and then is returned to the transformer.

Purifying equipment is mounted on a large van with doors for protection

(*Continued on page* 138)

Introducing an

ALUMINUM ALLOY HUB-RAK



the FIRST major distribution product in pole line hardware made of wrought heat treated aluminum alloy

LONGEVITY... Greatly increased.

It is estimated by experts that the new Hubbard Aluminum Alloy Rack will outlast any other rack made, as determined by scientific laboratory tests.

STRENGTH... More than adequate.

Exhaustive tests have demonstrated that the new aluminum alloy rack meets or exceeds all strength requirements, past or present, that have been established for steel racks.

WEIGHT . . . about one-third of steel rack.

Only 2¾ pounds, less insulators, as compared to over 8 pounds.

CORROSION RESISTANT . . . to ANY atmospheric conditions.

The aluminum alloy from which these racks are made was chosen as the best from hundreds of formulae and has been thoroughly laboratory and field tested to withstand all atmospheric conditions.

APPEARANCE . . . New cleanliness maintained.

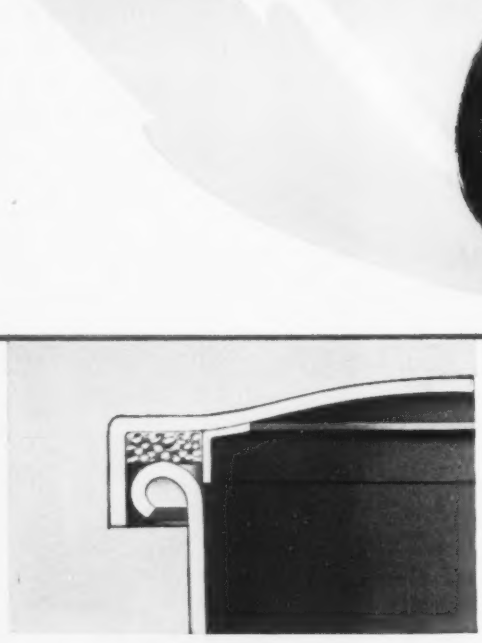
Bright new construction appearance is permanently maintained for the life of the line.

DESIGN FEATURES

1 Wrought, Heat Treated, Solid Aluminum Alloy.
2 Forged Solid Aluminum Alloy Points.
3 Solid Aluminum Link Type Cotter Key.
4 Aluminum Back shaped to form-fit the pole.
5 Side Mounting Slots 7/16" x 7/8".
6 Center Mounting Slots, 1 1/16" x 1¼" in line with conductors.
7 Can be mounted back to back on the same bolts.
Made to conform to E.E.I. Standards

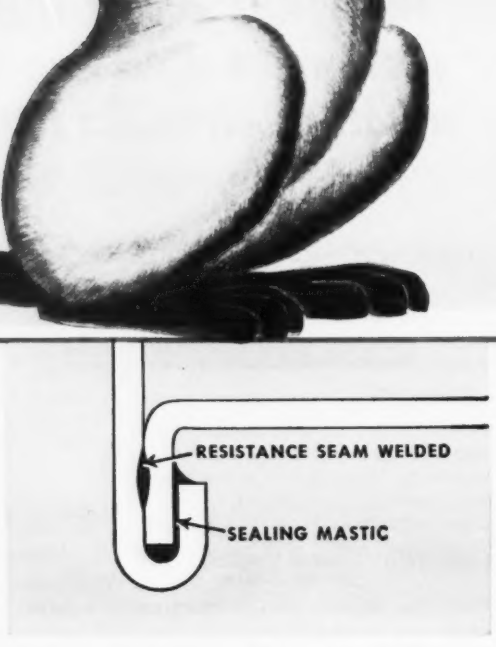
HUBBARD AND COMPANY
ESTABLISHED 1843
PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA
"Hang the Load on Hubbard Hardware!"

LONGER LIFE . .



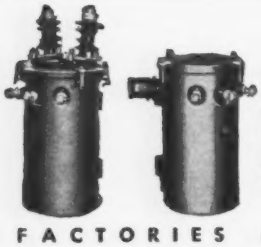
SEALED TANK CONSTRUCTION

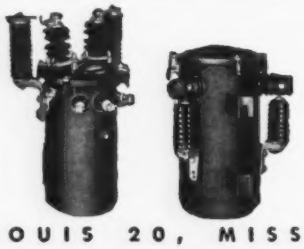
Sealed tank construction prevents entrance of moisture and air, greatly increasing the life of the oil and insulation. Illustration shows how cover gasket is retained and compressed to obtain a tight leak-proof seal.



WELDED AND ROLLED LIP ON TANK BASE

Tank base is pressed into tank shell and resistance seam welded. Sealing mastic compound is applied and the extending portion of the tank base is rolled in to provide triple protection against mechanical abuse.





Moloney HiperCore Distribution Transformers are available in all standard ratings from 3 Kva up in both Conventional and CSP designs.

MOLONEY

Manufacturers of Power Load Ratio Control Transformers

FACTORIES AT ST. LOUIS 20, MISSOURI AND TORONTO,

HiperCore TRANSFORMERS

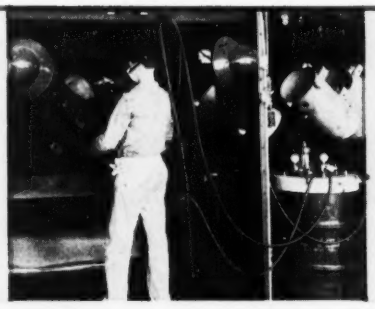
The cat has a reputation for nine lives because he has the natural ability to overcome extreme hazards and recover with a bounce. This is as much a part of the cat as is the high "margin of safety" built into Moloney Transformers.

Moloney Transformers have a reputation for long life every bit as good as the cat's. The superior design and craftsmanship of HiperCore Transformers permit quick and safe recovery from sudden overloads and voltage surges and thus provide dependable service under the severest conditions.

These qualities, proved by actual operation records, mean that you can equip your system with the high "margin of safety" afforded by Moloney Transformers. The superior engineering, design and fabrication know-how, that have been the mark of Moloney for more than 50 years, result in better performance, longer operating life with less maintenance.

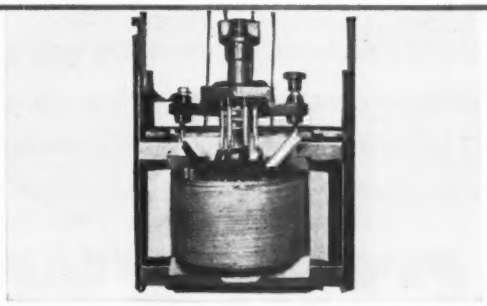
Moloney is better . . . all along the line.

ME53-43



TANK FINISH

Tanks are spray-painted, after thorough sand blasting with an alkyd melamine paint especially developed for Moloney Transformers. Each coat of paint is baked on. Resultant protective surface is durable, highly resistant to chipping, scuffing, and severe weather conditions.



GREATER MECHANICAL STRENGTH AGAINST SHORT CIRCUIT FORCES

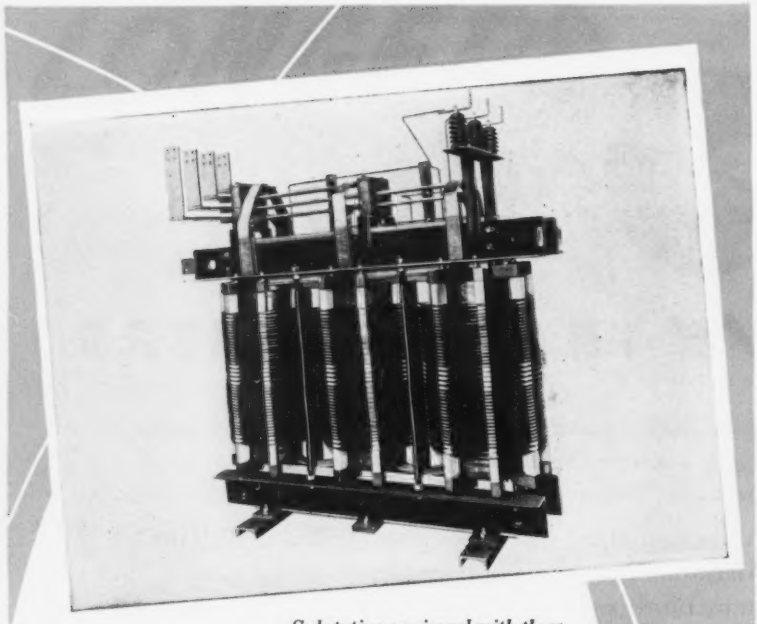
Coils are made mechanically rigid through the use of heat curing bonding material. The coils are blocked solidly by the impregnated core which is in turn banded with tons of force, providing maximum strength against short circuit forces.

ELECTRIC CO.

Transformers • Distribution Transformers
Step Voltage Regulators • Unit Substations

BETTER PERFORMANCE
GREATER RELIABILITY
LESS MAINTENANCE

ONTARIO, CANADA • SALES OFFICES IN ALL PRINCIPAL CITIES



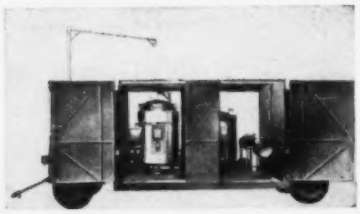
Substation equipped with three 1250 KVA single-phase Stockwell transformers.

EVERY STOCKWELL TRANSFORMER
is the result of specialized research and sound design. Rigidly controlled materials and modern production facilities are additional guarantees of the quality of our products.
Our field organization and our staff of application engineers at Akron will be glad to help you on all your transformer and substation problems.

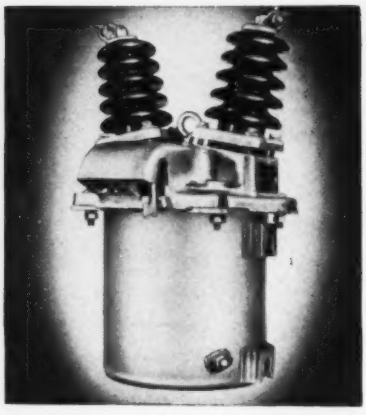
STOCKWELL
TRANSFORMERS
DESIGNED FOR YOUR REQUIREMENTS

STOCKWELL TRANSFORMER CORP.
AKRON, OHIO
OIL-FILLED, DRY TYPE, and ASKAREL-FILLED DISTRIBUTION AND POWER TRANSFORMERS

3-1



from dust and weather. There is a platform at either end that may be used for transporting supplies and transformers.
U. S. Hoffman Machinery Corp, Syracuse 6, N. Y.



Sectionalizer

A new 140-amp automatic feeder line sectionalizer, Type GRS, that counts pulses of fault current created by opening and closing of an automatic circuit breaker and isolates the feeder line after a preset number of counts has been announced.

The sectionalizer is oil filled, can be safely used to break loads up to 220 amp, and is trip free. It can be set to trip open after one, two, or three operations at or above 220 amp. Type GRS can be used on circuits up to 15,000 v and is said to operate up to 5,000 times without maintenance if necessary.
Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Truck Body

A new line of utility truck bodies has been announced. They are available in lengths from 8 to 13 ft, for single or dual-wheel chassis rated from ½ to 2 tons, with CA dimensions from 48 to 102 in. The bodies, designed for

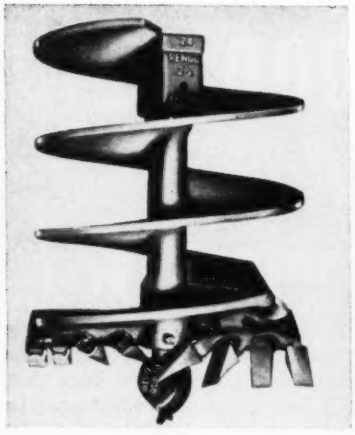
winch and derrick mounting, have a sliding roof, a window at the front, and three stowage shelves running all around the interior.

On the outside, the bodies are equipped with ladder hooks, hand grips, and three or more compartments on either side. Compartments are fitted with tumbler-type locks and

doors have recessed latches. Four doors with vertical hinges are hinged at the front. Two large doors opening from the top do not have stopper chains.

The ½ and ¾-ton models have 14 gauge steel front and rear panels, 16 gauge side panels, and 19 gauge steel doors. Models for chassis rated 1 ton and up are 14 gauge steel throughout. Understructure on all models is of 5-in. channel steel, with reinforced bridges over wheel housing and ⅛-in. diamond floor plate. Electric welding is employed throughout.

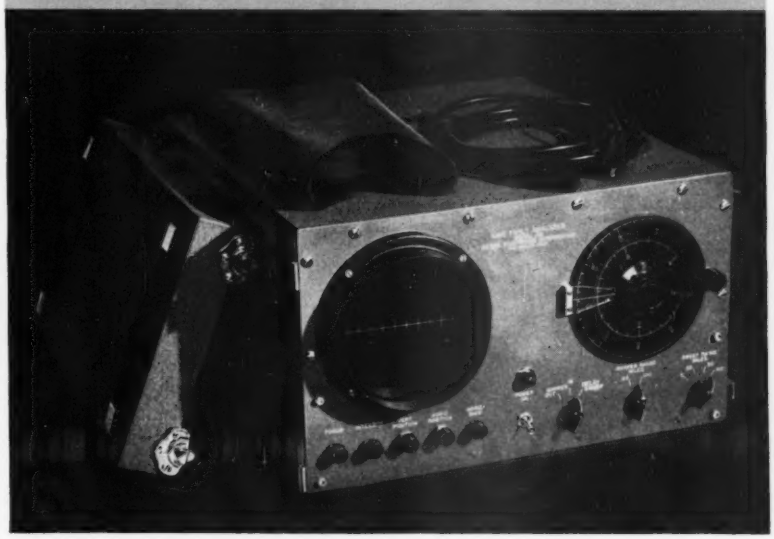
Morysville Body Works, 813 S. Reading Ave., Boyertown, Pa.



Augers

A new heavy-duty flight-type auger in sizes 16, 20, 22, 24, 30, and 36-in. diam and in lengths of 26 and 34 in.

Locate line faults instantly at ranges 1/2 to 200 miles



Model 124 Line Fault Analyzer

Now you can locate power, telephone or telegraph line faults instantly and accurately under all weather conditions. Sierra Model 124 Analyzer eliminates virtually all lost time, hard work and hazard of finding breaks, shorts, opens or other discontinuities. Operating from a powerhouse, transformer bank, substation or terminal point, it pinpoints faults from ½ to 200 miles away with accuracy of ±1 mile on the 200 mile range.

The Analyzer operates on radar techniques, sending a high amplitude pulse along a conductor and presenting echoes from discontinuities as pips on a radar-type "A" scope. Operation is extremely simple, and distances are read direct in miles. Calibrated sweep ranges of 5, 25, 50 and 100 miles are provided. A sweep delay extends range to 200 miles, or permits line segments as small as five miles to be presented full-screen. A movable distance marker can be ranged from 5 to 100 miles.

Model 124 weighs just 59 pounds; and is completely contained in a weatherproofed carrying case.

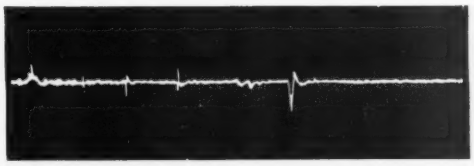


Figure 1

Test on 60 kv line, instrument on 100-mile sweep. Negative pip to right of center indicates line grounded at 60 miles. Other pips are switchyards, transformer bank, substation tap, carrier coupling capacitor, change in line configuration.

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2788

For complete details, see your Sierra sales representative or write direct for Bulletin 102B

sierra

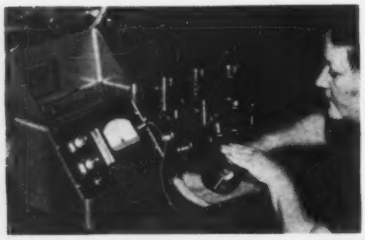
Sierra Electronic Corporation
San Carlos, California, U.S.A.
Sales representatives in major cities

Manufacturers of Carrier Frequency Voltmeters, Wave Analyzers, Directional Couplers, Wide-Band RF Transformers, Custom Radio Transmitters.

has been announced. Boring features are identical with PENCO helix auger and all parts are interchangeable. Additional flights add to the carrying capacity. Other features are double cutting and flights level as possible.
Petersen Engineering Co, Santa Clara, Calif.

Roughness Tester

A new instrument for measuring surface roughness in a non-destructive test has been announced. It is capable of measuring from 1 to 1,000 microinches average deviation from the



mean surface. A variable cut-off switch permits the separation of waviness and roughness characteristics of surfaces by filtering out wave lengths exceeding 0.003, 0.010, or 0.030 in.

In operation, a diamond tip stylus is moved across the peaks and valleys of the surface to be checked. Microscopic mechanical motion is transformed by a movable plate vacuum tube transducer into electrical signals that are amplified and indicated on a meter as roughness. Accuracy is said to be assured because the instrument is equipped with precision reference specimens, which provide a simple and accurate calibration. A 115-v, 60-cps power source is required for operation.
Brush Electronics Co, 2405 Perkins Ave., Cleveland 14, Ohio

Motors

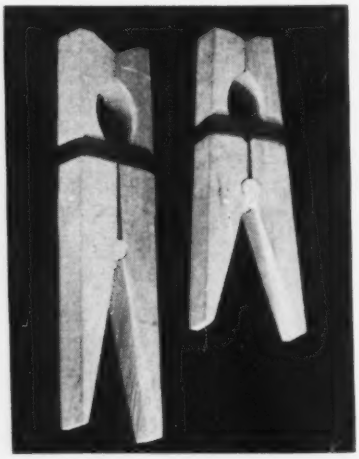
A new line of electric motors in open drip-proof, totally-enclosed fan-cooled, and explosion-proof enclosures has been announced. They are built in accordance with NEMA frame size standards and are available in ratings up to 40 hp.

Utilizing more power in the smaller redesigned unit has been accomplished by using large lamination diameters and long stacking with short coil ends.

Size and bulk of housing and motor bearing brackets have been reduced without sacrificing mechanical strength. Ventilation is said to be improved because of better utilization of aerodynamic principles. Shaft and factory lubricated bearings have been selected for long life and high overload capacities.
Louis Allis Co, Milwaukee 7, Wis.

Wood Clamp

A new clamp for linemen's rubber blankets that can be applied easily and offers maximum safety protection has been announced. Jaws are made of smooth finish, close-grained poplar and work on a wooden spool fulcrum. The clamp can be ordered with or without a dowel pin on the lower jaw.

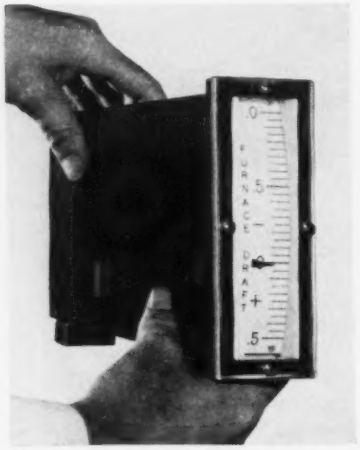


Tension for holding the jaws in place is furnished by three bands of super-aging rubber that are placed into grooves in the jaws. Only one band is necessary to hold the clamp in position. Clamp sizes available are 7½ and 10½ in.
Surety Rubber Co, Carrollton, Ohio

Draft Gauge

A new, bantam gauge for measuring draft, pressure, vacuum, or differential draft has been announced. The unit is said to be complete in one case, and no extra transmitters or accessory mechanisms are needed.

Full sized diaphragms or bellows are used in the gauge. Diaphragm elements are available for pressure ranges from 0.6 to 40 in. of water. With bellows elements, the gauge may be used as a receiver for transmission pressures

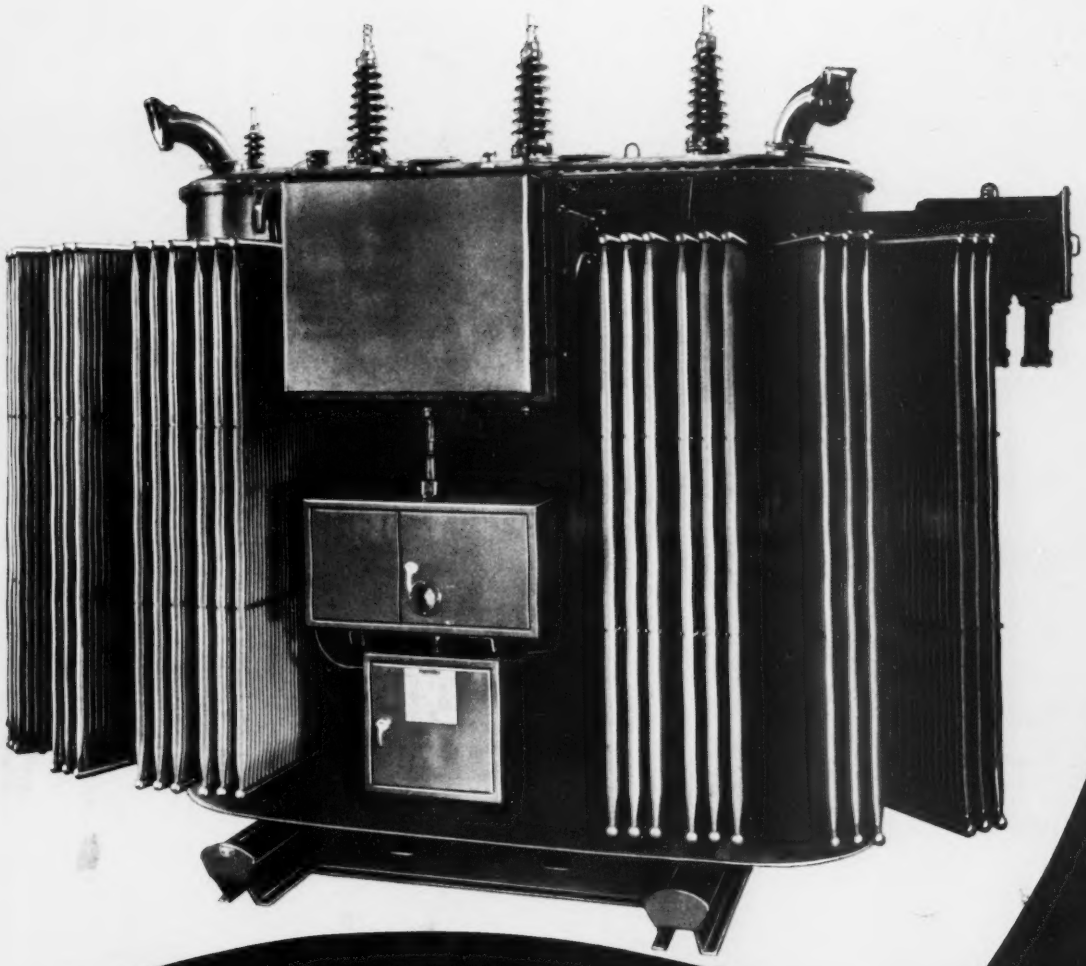


between 5 and 30 psi. The gauge can also be furnished with two bellows and two pointers.

The gauge's bezel is 6 7/16 in. high and the scale has a 5-in. graduation length, which is illuminated from the rear by either incandescent or fluorescent bulbs.
Republic Flow Meters Co, 2241 Diversey Parkway, Chicago 47, Ill.

Blower

A new furnace blower for cleaning extremely wide boilers where the blower nozzle must travel more than 25 ft has been announced. Among its features are the rigid truss construction for simple support and step-tapered lance for minimum deflection. An auxiliary carriage supports the feed tube and the drive shaft in the extended position.



20,000 KVA *three phase* Pennsylvania LOAD RATIO CONTROL Transformer

See next page for inside story

The low voltage windings of this Pennsylvania transformer are provided with tap changing underload equipment for plus and minus 10% regulation in 32⅝% steps. Self-cooled, the transformer has a rating of 20,000 Kva. However, there are provisions for the future installation of fans to increase the rating to 25,000 Kva. The transformer is designed to step down a transmission voltage of 69,000 volts to 13,200 volts.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division **CANONSBURG, PA.** *Greater Pittsburgh District*

20,000 KVA *three phase* Pennsylvania

LOAD RATIO CONTROL

Transformer

Straight-line, no-load tap changer on high voltage side.

Preventive auto transformer permits uninterrupted current flow during tap changes.

Series transformer reduces current of load ratio control mechanism.

Well-insulated tap leads, rigidly supported in heavy pressboard tubes, are connected to the straight-line, no load tap changer.

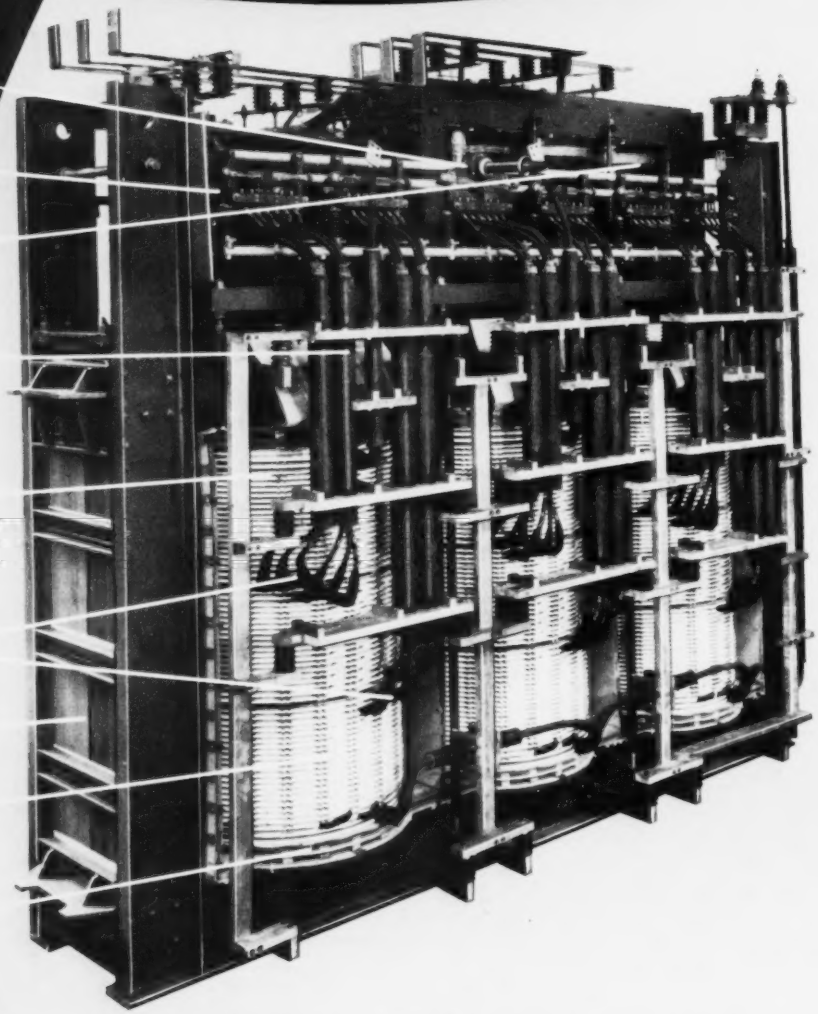
Coils are precompressed with a force equal to the highest short circuit stress and built into the transformer at that compressed dimension. This prevents mechanical distortion of the coils if short circuit stresses occur.

Two sets of taps per coil assure excellent electrical and mechanical balance in the windings.

Five-legged core reduces height of transformer.

Continuous pancake winding in High Voltage coils. Helical winding in Low Voltage coils.

Line ends of coils are heavily insulated to provide extra protection against surge voltage stresses.



For exterior view of this transformer, see other side

pt

20,000 Kva. Three phase, 60 Cycles, 55°C. Temperature rise. High Voltage: 69,000Y volts. Low Voltage: 13,200 Delta volts. Low Voltage windings provided with tap changing underload equipment for plus and minus 10% regulation in 32 5/8% steps.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division

CANONSBURG, PA. *Greater Pittsburgh District*

A motor mounted at the boiler end propels and rotates the lance tube through a close-pitched blowing pattern for high-intensity and uniform cleaning. The poppet type supply valve is mechanically operated and has an adjustable pressure control for greatest blowing economy.

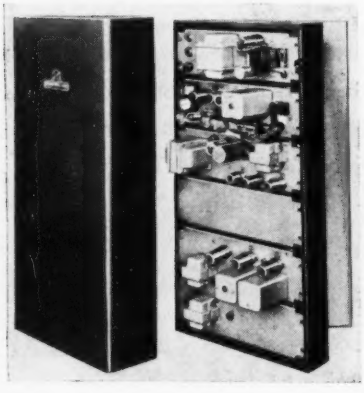
Diamond Power Specialty Corp, Lancaster, Ohio

Annunciator

A new panel mounted individual lamp annunciator called Model MLT, has been announced. It contains lamps, relays, switches, etc and is completely factory-wired for the specified operation. A back-lighted illuminated nameplate is fastened to the front of the small metal cabinet.

The rear of the cabinet holds the terminal block for connection to the supervised trouble contact, power and common audible service. A 1¾ x 4½-in. opening in the panel is required for mounting. The unit is also available without the toggle switch.

H. R. Kirkland Co, Morristown, N. J.



Selective Systems

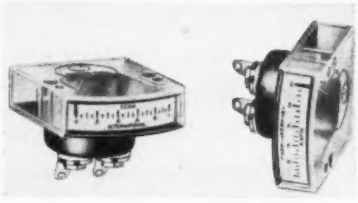
A selective calling system for telephone channels on microwave, VHF, or UHF point-to-point radio systems has been announced. With the tone dialing equipment, it is possible to selectively call between any two points of a communications network with as many as 126 stations. Unwanted stations are not alerted. Group calling is provided when desirable.

The system, which includes a telephone dial, indicator head, and SCTR-25 terminal equipment, makes use of coded audio frequency tone signals activated by a dialing operation.

Hammarlund Manufacturing Co, Inc, 460 W. 34th St., New York 1, N. Y.

Panel Meters

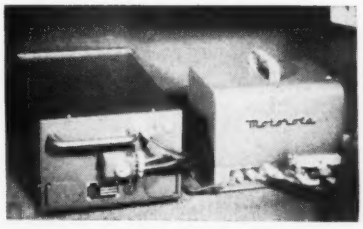
A new line of miniature side indicating panel meters has been announced that is said to provide maximum scale length with minimum panel areas. The self-contained units are available with flanges for single and



back-to-back mounting and can be grouped in horizontal and vertical arrangements.

They have an accuracy of ±3% of full scale deflection on dc and ±5% on ac. Ammeters, voltmeters, and other meters are available in zero center, left and right models.

International Instruments, Inc, P. O. 2954, New Haven 15, Conn.



Converter units

Two small, highly efficient 12-v to 6-v converter units have been developed to prevent the obsolescence of 6-v mobile two-way radio units by the trend toward 12-v automotive electrical systems. One converter is capa-

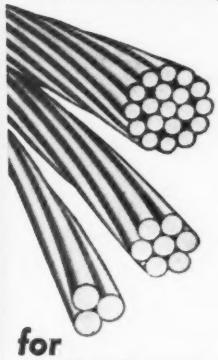
(*Continued on page* 146)

an ACCO product

Stainless Steel STRAND

PAGE

will make it again



for GROUND GUY MESSENGER CATENARY

Higher—
Corrosion resistance
Tensile strength
Elastic limit
Resistance to abrasion
Strength-to-weight ratio

Lower—
Cost per year during use

Present restrictions prohibit our furnishing PAGE *Stainless Steel Strand today, but it will pay you to consider it for the future.*

PAGE Strand

ACCO

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.

A Purchasing Agent for a Utility ASKS —

"Is it possible to determine by visual inspection whether or not an insulator is okay?"

HERE'S OUR

Absolutely Not! Visual inspection alone cannot determine whether an insulator is fit for electrical service. Visual inspection does play an important part in the manufacture of Pinco Insulators in determining dimensional accuracy and physical appearance. However, it is necessary to subject *every* insulator to routine electrical and mechanical tests to be absolutely certain that the insulators we ship will more than meet the electrical and mechanical loads they will be subjected to in service.

It is because of Pinco's strict adherence to quality and production control methods *plus* rugged mechanical and electrical tests that Pinco Insulators have given top performance for more than 30 years.

That's why we say—*it pays to put up Pinco!* They're RIGHT *for* the job . . . always RIGHT *on* the job!

P.S. *Like further proof of Pinco's service records covering all types of Insulators? Drop us a line . . . or ask your Joslyn salesman.*

The Porcelain Insulator Corporation LIMA, N.Y.

Suspension Insulators . . . Clamps and Fittings . . . Switch and Bus Insulators . . . Distribution and High Voltage Pin Types . . . Guy and Tree Insulators . . . Special Porcelain.

NO. 12 IN A SERIES

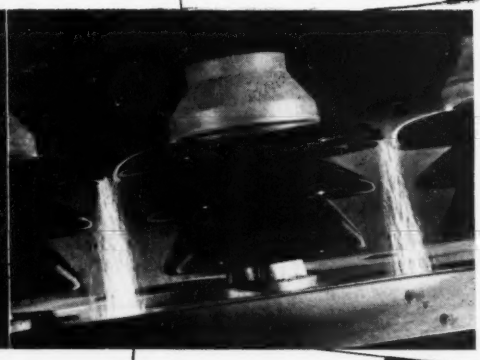
STRENGTH TEST . . . After Assembly, each Pinco Unit is given a routine strength test in an automatic machine before the final electrical test. Shown are Pinco 1070 Suspension Insulators with 15,000 lb. mechanical rating undergoing this test.

ANSWER

EVERY PINCO INSULATOR MUST PASS THESE GRUELLING TESTS OR BE REJECTED . . .

60 CYCLE FLASHOVER TEST . . . Following routine mechanical tests, insulators are given a final 60 cycle flashover test. These Pinco 1060 Suspension Units must stand up under maximum flashover voltage for 5 minutes to prove they can perform 100% under unusual electrical line surges.

160,000 VOLTS are applied to these Pinco 735 Switch and Bus Units in the final 60 cycle test. Each part of this insulator has also been tested electrically before assembly.



In addition to these routine mechanical and electrical tests, Pinco Insulators selected at random are subjected to the standard E.E.I. Nema design tests. It is precise quality and production control methods such as these, from clay to finished product, which insure Pinco "RIGHT ON THE JOB" service . . . points well worth remembering when you specify and purchase insulators.

HIGH FREQUENCY FLASHOVER TEST . . . These Pinco Suspension Insulator Shells are being subjected to a high frequency flashover test. Electrical performance of all Pinco Insulators is insured by tests such as this.

PINCO INSULATORS

RIGHT ON THE JOB—

21.5 miles of closed circuit . . .
106.1 miles of open circuit . . .
(remotely and automatically controlled . . .)
plus
. . . selective and continuous telemetering . . . carrier . . . and telephone communication!
Hydroelectric Plant Cubicle
Dispatcher's Control Panel
16 OPERATIONS ARE PERFORMED BY SUBSTATION'S DISPATCHER
Operations Include:
Start and stop generator over carrier . . . Control of generator loading and automatic synchronizing . . . Generator protective shut-down . . . Telemetering . . . Telephone communication
Utility Bulletin AA-2 shows how supervisory control, telemetering, and communication can fit into your power picture. Write for it.
POWER PLANT
SWITCHING STATION
SUBSTATION
TO SUBSTATION
Southwest Hydroelectric Plant Goes Super-Trol*
CONTROL CORPORATION equipment was chosen for this irrigation project located in Southwestern United States. The supervisory control, carrier current, telemetering, and semi-automatic control equipment supplied was designed to control and give . . .
Supervisory control of the semi-automatic operation of the Power Plant from Dispatchers Office. Selective and continuous telemetering indications of various quantities at the Power Plant . . . all remotely and automatically controlled!
*Registered trade-mark of Control Corporation, Super-Trol is the modern method of remote, supervisory control.
CONTROL CORPORATION
719 CENTRAL AVE. N. E. • MINNEAPOLIS 14, MINN.
• Super-Trol • Peak-Trol • Telemetering • Battery Chargers • Carrier Current •

ble of supplying from 10 to 50 amp, the other from 10 to 30 amp.

Both units utilize a transformer-vibrator circuit and have conversion efficiencies of better than 80%, it is claimed. Long life and high reliability are assured through use of a heavy-duty, 16-v vibrator. The units may be mounted either in the automobile trunk or under the instrument panel. Overall dimensions are 7 x 9¼ x 6¾ in.

Motorola Inc, 4545 W. Augusta Blvd., Chicago, Ill.

Lighting Unit

One standardized explosion-proof Unilet body has been announced that will fit both 60 and 200-w and 300/500-w dome unit assemblies. This is claimed to overcome the time-consuming problem of lamp exchange in hazardous locations, Class 1, Groups C and D.

Five threads are engaged when contact is made or broken. Thus, arcing during fixture exchange is confined in an approved explosion-proof manner. Because of interchangeability of the assemblies, it is possible to set up a stand-by system for lamp replacement and increased wattage needs.

Appleton Electric Co, 1701 Wellington Ave., Chicago, Ill.

MORE NEW PRODUCTS

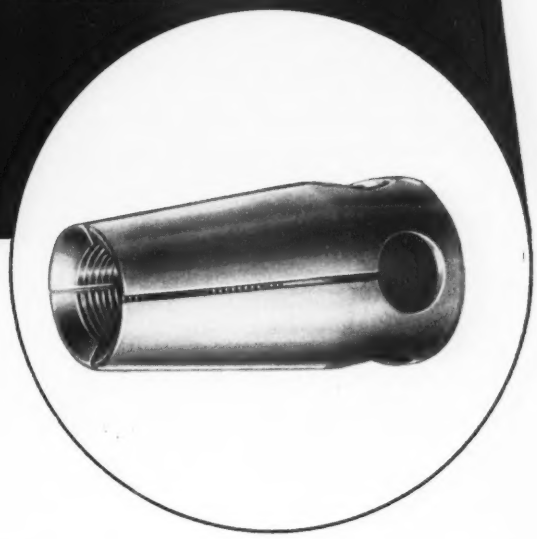
about which you should know

Galvicon Corp, 40 W. 29th St., New York 1, N. Y., announces a new method of **cold galvanizing** for surface protection of steel and iron . . . General Electric Co, Schenectady 5, N. Y., has a highly sensitive, crystal-type **accelerometer** for use as a detection element in measuring vibration acceleration up to 50 G.

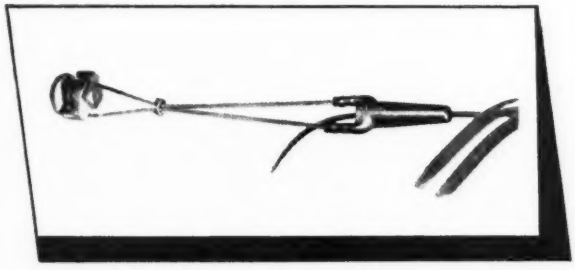
Henry G. Dietz Co, 12 Astoria Blvd., Long Island City 2, N. Y., has improved its Cat. 104 sensitive static **pressure controls** . . . Perkins Engineering Corp, 345 Kansas St., El Segundo, Calif., announces a new magnetic amplifier **regulated power supply** rated 5 to 32 v dc at 15 amp.

Technology Instrument Corp, Acton, Mass., announces a secondary **phase standard** for altering the phase of an input sinusoid.

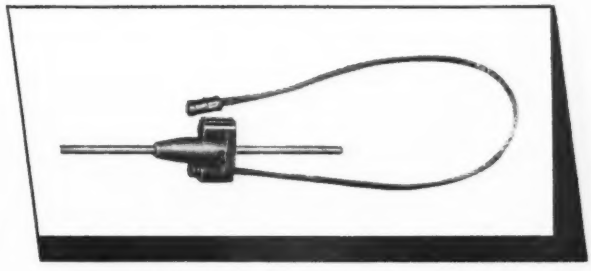
FARGO AUTOMATIC Service Cable Dead Ends



Fargo Automatic Triplex Dead Ends all use the exclusive Fargo "one-piece" jaw . . . precision machined from solid rod stock (aluminum or bronze) . . . to assure perfect alignment and spacing of the four jaw segments. As tension is applied, the jaw and conductor move forward as a unit to complete the even grip necessary for the best holding power. The "one-piece" gripping jaw has been time proven in the standard Fargo Automatic Line Splices and Dead Ends.



The "SDEA" Series for Aluminum and ACSR with Flexible Bail*



The "R" Series for Copper with a detachable Flexible Bail.

These units save labor and cable, are easily adjusted for proper sagging, are reclaimable, and develop at least 1100 pounds holding power. There is a minimum of nicking or damaging of the messenger. The messenger is in contact with like metal jaws and extends through the gripping unit for connecting to neutral or ground. Aluminum dead ends are factory dipped in corrosion inhibiting grease.

* Cat. No. "SDE" dead ends are available for copper messenger.

Ask your Line Material Field Engineer to give you complete details.

FARGO

Manufactured by

FARGO MFG. COMPANY, INC.

Poughkeepsie, N.Y.

Distributed by

LINE MATERIAL COMPANY

(A McGraw Electric Company Division)

Milwaukee, Wisconsin

LETTERS TO THE EDITOR

Says Luminous Ceiling Is No "Expensive Innovation"

To the Editor:

An association of ideas, unfortunate from the point of view of makers and sellers of luminous ceiling lighting, is contained in the article "Utility Sets a Lighting Example," Electrical World, Sept. 7, page 90. I am sure that the author, Mr. Whitney, did not intend an inference that luminous ceilings and indirect lighting should be "immediately ruled out" as "expensive innovations" from consideration for a lighting installation to be used as an example for others.

Yet such inference is apparent from Mr. Whitney's article. It is particularly unfortunate in respect to our company because the term "luminous ceilings" is a part of our corporate name.

The article describes what is evidently a perfectly competent installation that can be held up as an example of good work-a-day lighting and adequate wiring provided at minimum cost for temporary use. However, we believe the installation would be a better example of modern lighting for the customers of the utility to follow if it included luminous ceiling lighting in those areas where this kind of illumination with its accompanying acoustical and appearance features has particular value.

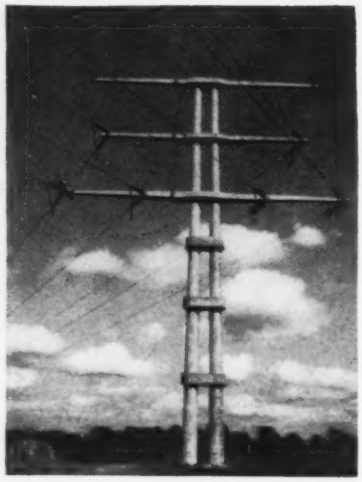
Considering these accompanying features as well as its avoidance of specular reflections and its much better light distribution, we, and more importantly, many users, do not feel that the luminous ceiling is expensive. Nor should it be regarded as an "innovation."

It is accepted widely as an established lighting method to which the implication of new and unproved contained in the word "innovation" does not apply.

As for the temporary nature of the installation, this does not rule out the luminous ceiling.

Its components of hung ceiling and lighting and acoustical equipment can be as readily moved to a new location as can any collection of lighting fixtures.

Laurence Urdang
Director of Public Relations
Luminous Ceiling, Inc.
Chicago 47, Ill.



A Concrete Piece of Work

To the Editor:

In Electrical World Aug. 31, you show on the cover a photograph of a transmission line structure—a type of which we are unfamiliar.

It has created speculation in our organization as to the material used in such a structure, the voltage, method of erection, etc.

Do you have such information? Could you direct us to a source where we might obtain same?

Evans E. Presley,
Field Engineer
Robert E. Foley Construction Corp
Binghamton, N. Y.

• The structure shown is a rotated hollow concrete structure used in Germany for voltages ranging from 60 kv to 120 kw. Electrical World has obtained from Europe an illustrated article describing the fabrication, erection and use of the structure. This article will appear shortly.

Amen on Heating

To the Editor:

Quite often I disagree with some of your editorial matter, but this time I find your Nov. 2 editorial on electrial on electric house heating expresses thoughts with which I am much in sympathy. You are very right when you say that "In the final analysis and although the utility can do much to advise and instruct, it is the customer who says what the load will be. And if people want and will pay for electric heat in houses open to the four winds, it is the utility's business to supply the electricity."

Our experience in serving 15,000 residential customers with electric heat bears this out. We should, of course, be concerned with many of the facts that you mentioned that have to do with the use of electricity for heat; but I have observed, as you indicate in what you say, that there is a tendency on the part of many utilities to be more or less dictatorial about how our customers use the service they purchase from us.

If we expect to do a complete energy job in the home, and there are many customers who will gladly pay us what they feel is a reasonable price for such service, then it seems to me that we are going to have to do as you say, consider electric heating as a component of the residential load and not as something separate and apart from it.

Years ago we went through the same "growing pains" and worry about electric cooking and water heating and had all sorts of special rates, circuits, hours of use, etc. As I look back I find that most of the customer trouble which I have had in the utility business has been due to a lot of rules, regulations, instructions, and requirements that I placed on my customers' use of the electricity they were purchasing from me.

S. R. Finley
General Superintendent
Electric Power Board of Chattanooga
Sixth and Market Streets
Chattanooga 2, Tennessee

Dynamite Kit

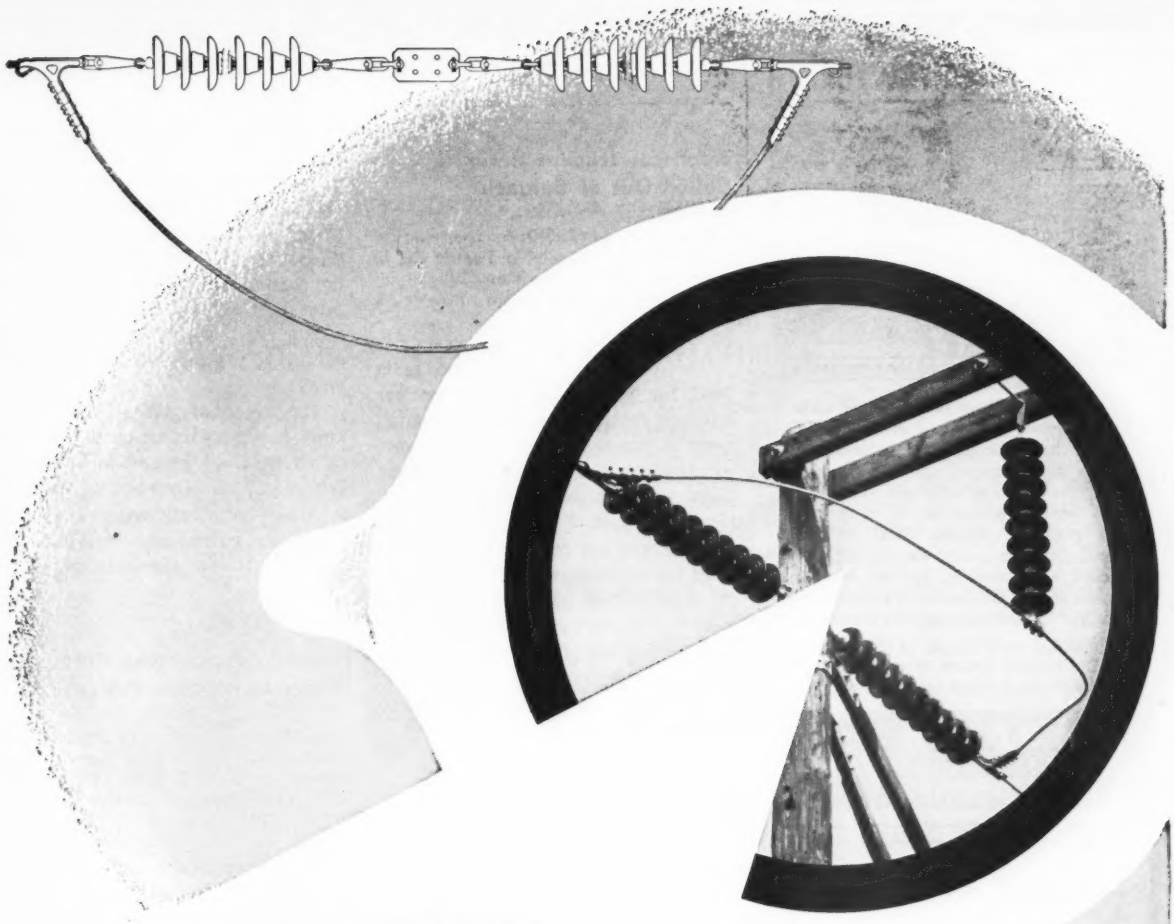
To the Editor:

In your June 1, 1953 issue there was an illustration of a dynamite kit and reference to the maker, Clements Manufacturing Company, Dallas 2, Texas.

Will you please advise if better address is available?

H. J. Smith
Supt. of Tele. Dept.
Equitable Gas Company
420 Boulevard of the Allies
Pittsburgh 19, Pennsylvania

• The full address is: Clements Manufacturing Co, 138 Cole St, Dallas 2, Texas.



THE POWER CAN'T "SEE" *THESE JUMPER LOOPS*

The only splices you must have on a transmission line are between reels. Spliced jumpers at strain points, and the troubles that go with them, are unnecessary.

Continuous-cable jumper loops are the natural consequence of using Hi-Lite strain clamps. Jumpers that the power can't "see" are just as easy to build - or easier - than those with splices.

As a bonus you get a clamp that is inherently low priced; that installs in a matter of minutes; that takes nothing more than a common hand wrench by way of installation equipment. The clamp can be physically checked any time in the life of the line for holding power.

Take a look at your deadend clamping practice and consider the advantages of mechanical simplicity and unspliced jumpers.

Ohio Brass

MANSFIELD OHIO, U.S.A.

IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

4389-H

IN THE FIELD as in laboratory tests . . . ***Crapo*** Galvanized Steel Strand proves itself capable of withstanding severe punishment. Steel's inherent strength and durability are combined with definite economies in every size and grade of ***Crapo*** Steel Strand. You'll find the heavy, ductile, tightly-bonded zinc coatings, applied by the famous ***Crapo*** Galvanizing Process, provide lasting protection against corrosion.

Contact your jobber of *Crapo* Galvanized Products or write direct for further information!

INDIANA
STEEL & WIRE COMPANY
MUNCIE, INDIANA

PRESSITE
an unsized fibreboard having excellent dielectric, physical and chemical properties. Is used principally in air, oil and askarel transformers.

ELECTRITE
a high grade board for electrical insulation, possessing high tensile and dielectric strength. Used in a large variety of punchings and other insulating applications.

DENSITE
an extremely hard and tough board of superior quality. Used by many leading manufacturers of electrical equipment to replace more expensive types of insulating materials.

Pulp Products Department

WEST VIRGINIA
PULP AND PAPER COMPANY
230 Park Avenue, New York 17, N. Y.
35 E. Wacker Drive, Chicago 1, Ill.

WHAT THEY'RE SAYING

At Industry Meetings

Electrical Student Ratio Called Out of Balance

HORACE P. LIVERSIDGE, chairman of the board, Philadelphia Electric Co, at annual meeting Engineers Council for Professional Development, New York City.

The public concept of the great need for the electronic and nuclear sciences for large numbers of engineers is greatly distorted, and somewhere along the line this should be corrected. At present, in the senior electrical group at one technical school, three out of four men want to enter the electronics field. This is out of all proportion to industrial requirements. This is clearly illustrated by the fact that one large electrical manufacturing company used only 25% of its new engineers in direct electronics applications.

States CIO Opposition To Atomic Act Change

O. A. "JACK" KNIGHT, president of Oil Workers International Union, CIO, and chairman of CIO's Natural Resources Committee, at Second Annual Conference on Atomic Energy in Industry, sponsored by National Industrial Conference Board.

With a $12 billion investment in atomic energy, the average citizen of this country is determined that the atomic energy resources of the country must be used in his behalf.

The CIO in 1946 supported public ownership of atomic energy facilities and eventual world-wide public ownership. It is still our position that we are opposed to changes in the Atomic Energy Act that will curtail or reduce federal ownership and use of atomic energy.

Only large public or private corporations can possibly provide capital for development of atomic energy. If these developments were operated by private enterprise, they would develop into monopolies operated by the largest corporations to the detriment of the public. Such gigantic projects should be handled through public agencies responsible to the people as a whole.

We think the federal government has a greater sense of public responsibility than the large corporations do, and will be more likely to take the necessary safety measures (such as shielding, etc.) at the atomic energy projects.

The attempt to turn atomic energy over to private enterprise is part and parcel of the current grab going on in offshore oil, hydro power, and the public grazing lands. We intend to oppose the giveaway in this field of atomic energy and fight to keep atomic energy as the province of the federal government.

The potential giveaway of atomic know-how may dwarf combined value of all previous giveaways in history. We believe in government operation in power and atomic energy—we want to see the government build and operate plants and distribute the power from them.

Private Development Held Proper for Atomic Power

WALTER L. CISLER, president, Detroit Edison Co at Second Annual Conference on Atomic Energy In Industry, National Industrial Conference Board, New York City.

I have never heard a tenable reason advanced why private industry should be excluded from developing, building, owning and operating a reactor for the purpose of generating power under circumstances which will insure national security, public health and safety. Those who oppose it would render a public service if they could and would tell us why the government and the government alone should do the job.

Some assert fear of a grand "give away" in atomic energy, expressing the desire to "preserve to the taxpayers the enterprise that the government has built with $12 billion appropriated from the public treasury." But no government facilities would be transferred except for a reasonable price. Most of the technical knowledge (apart from weapons affairs) is already a part of the public domain. There is no "give away," but only a greater opportunity for private competitive industry to assume its traditional role of developing new discoveries of science and new resources to advance the economy and industry of America—and the rest of the world.

CHANCE Plate Anchors

Speed Transmission Guying

...SAVE MAN HOURS—CUT COSTS—HOLD GREATER LOADS

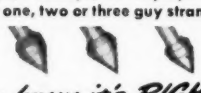
CHANCE NEVER-CREEP ANCHORS

You gain two ways when you choose Never-Creep Anchors for guying transmission or heavy distribution lines. First, they can be installed in machine bored holes because the size of the hole makes no difference in the holding power of the Never-Creep. Second, these anchors pull entirely against solid, undisturbed earth because the hole is at an angle away from the guy.

Never-Creep anchor plates are formed of high strength structural steel and are reinforced in the area of greatest pull with a high carbon steel core plate and the socket or "rod lock" plate which has reinforcing ribs. Dual-purpose creep guards keep the anchor from creeping up the hole and guide the rod point into the socket.

Circle shows reinforcing plate and rod socket.

Chance Anchor Rods, for use with the Never-Creep, are drop forged with a Thimbleye, Twineye, or Tripleye for use with one, two or three guy strands.



CHANCE CROSS-PLATE ANCHORS

The Chance Cross-Plate Anchor helps speed up big line construction jobs. It replaces improvised "dead-men" and can be installed in slanted or vertical machine bored holes in any kind of soil. This all-steel anchor compares in cost with an average 4 foot treated log.

Laboratory tests on a Chance X-24 Cross-Plate proved it capable of indefinitely withstanding a pull of 70,000 lbs. with only slight bending, while a creosoted log split under a 20,000 lb. pull in a few hours.

Nut retainer aids installation.

You know it's RIGHT when you specify CHANCE

A·B·CHANCE CO·

CENTRALIA, MISSOURI
SAN FRANCISCO, CALIFORNIA

ANCHORS • GUYING FIXTURES • LINE CONSTRUCTION TOOLS • CONDUCTOR CLAMPS
GROUNDING EQUIPMENT • HOT LINE TOOLS • HIGH VOLTAGE SWITCHES • CUTOUTS

FIND OUT WHY!

It's wise to use Chance Anchors instead of "dead-man" logs or slugs. Write today for test records and actual cost comparisons. We'll send you reasons why your next transmission line should be guyed the stronger, low-cost way — with CHANCE Anchors.

C53-8B

Drake Made a Vice President

West Penn Power's newly elected official will head the utility's power production department

W. V. DRAKE

W. V. Drake has been elected a vice president of West Penn Power Co. The company veteran succeeds H. S. Fitch, who has retired after serving the utility for 40 years. (EW, Nov. 9, p 30).

As head of the utility's power production department, Drake is responsible for power generation, coal mining, generating station construction and operation, and system operation and dispatching.

Drake joined West Penn Power in 1921 as assistant to the superintendent at Springdale Power Station. A year later he became operating engineer, transferring to the company's Pittsburgh office as superintendent of mechanical operation in 1923.

He moved five years later to Monongahela Power, a sister company of West Penn, at Fairmont, W. Va., as superintendent of power stations. He was made manager of power generation in 1931, continuing in that position until his transfer back to West Penn Power in 1949 as manager of power production.

In April of this year, he was appointed assistant vice president in charge of power production for West Penn Power.

The newly elected official is a member of the Prime Movers Committee of Edison Electric Institute and the American Society of Mechanical Engineers.

Brown, Horner Are Elevated

J. S. BROWN

Duquesne Light Co has appointed J. S. Brown chief engineer and R. B. Horner chief design engineer. Brown will be in charge of the engineering department and Horner will be in charge of the design department.

Associated with Duquesne Light since 1937, Brown was named in 1945 electrical station engineer in charge of all the utility's power stations, substations, and electrical engineering and design. Six years later he was appointed electrical engineer in charge of the electrical engineering department, a position he held until his present assignment.

Prior to joining Duquesne Light, he was affiliated with Potomac Electric Power Co, General Electric Co, and Radio Corp of America.

Active in industry associations, Brown has handled many committee assignments for Pennsylvania Electric Association, American Institute of Electrical Engineers and American Standards Association.

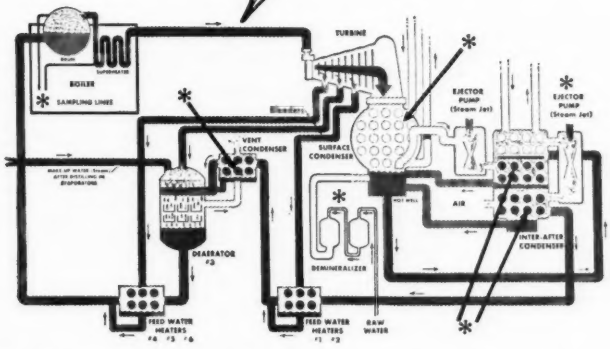
R. B. HORNER

Horner joined Duquesne Light in 1926 as an engineer in the engineering department. He was made structural engineer in 1927, a post he held until his new assignment.

A. M. Harrison, who has served as manager of the transportation engineering department of the Transportation and Generator Division of Westinghouse Electric Corp at East Pittsburgh, Pa., since 1952, has been named manager of the T&G engineer-department. **P. G. Lessmann** has been appointed assistant manager for the department. Harrison joined Westinghouse in 1926. Lessmann, who has served as engineering section manager at East Pittsburgh for the past nine years, also began his career with Westinghouse in 1926.

Harry C. Hackett, sales manager of National Vulcanized Fibre Co, Wilmington, Del., has been promoted to staff sales manager. **James O. Otis,** assistant sales manager and advertising manager, has been advanced to sales manager. Hackett will continue his duties as president of National Vulcanized Fibre Co of Canada, and assistant secretary of National Vulcanized Fibre.

CUT
Corrosion Control Costs
HERE
*



...with *Carpenter* STAINLESS Tubing and Pipe

At a growing number of steam-electric generating stations, Carpenter Stainless Tubing and Pipe are providing trouble-saving, cost-cutting solutions to corrosion problems in sampling lines, vent condensers, inter and after condensers, surface condensers, evactors, and in applications with demineralizers and other water conditioning equipment. Helping industries to solve corrosion problems is a 26-year-old story with Carpenter. In addition to providing optimum corrosion-resistance under any service condition, Carpenter Tubing and Pipe help to cut corrosion control costs in other ways. Their exceptionally uniform wall thickness, ductility, and unvarying piece-to-piece quality assure trouble-free fabrication and time-saving fitting and rolling in . . . less down-time when retubing is necessary. In short, there *is* a difference in stainless tubing and pipe and Carpenter makes it. It's a difference that's measurable in adherence to rigid standards of analysis, dimensions, finish, tolerance, concentricity and ductility.

Whenever you have a corrosion problem involving tubing or pipe, it will pay you to call in your nearest Carpenter representative. You can count on him for time-saving delivery on your requirements plus engineering and fabricating assistance. "One Call Does It All" when you put your corrosion problems in Carpenter hands.

The Carpenter Steel Company, Alloy Tube Division, Union, N. J.

Branch Offices: Atlanta Chicago Pittsburgh
Houston Newark San Francisco

Export Dept.: The Carpenter Steel Co., Port Washington, N.Y.
"CARSTEELCO"

Carpenter

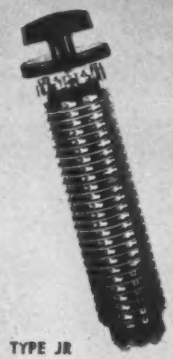
STAINLESS TUBING & PIPE

Analysis → Tolerance → Finish →

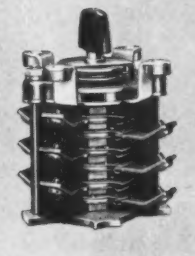
- guaranteed on every shipment

ROTARY SWITCHES

For every control, tap, and transfer application.

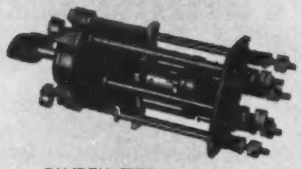


TYPE JR

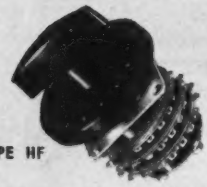


TYPE P, 30A

TYPE A



TANDEM TYPE P, 30-10A



TYPE HF

- Save valuable panel space
- Simplify control of complex circuits
- Give "dead-front" mounting safety
- Listed by Underwriters Labs, Inc.
- Can be furnished to latest Navy specs.
- Ratings from 2 amperes to 200 amperes, 30 to 250 volts d. c., and 125 to 500 volts a. c. — depending on number of circuits and nature of load.

Write for combined catalog giving useful design data on Esco rotary switches.

ELECTRO SWITCH
CORPORATION
167 King Avenue, Weymouth 88, Mass.

Wisconsin Group Elects

Wisconsin Utilities Association has elected L. P. Works, Wisconsin Public Service Corp, as chairman of the Electric Section of the Technical Division. M. E. Juhl, Lake Superior District Power Co, was elected vice chairman of the section. The association has also elected J. H. Dunham, Wisconsin Electric Power Co, as chairman of the Electric Section of the Sales Division. H. R. Norton, Wisconsin Power Light Co, was elected vice chairman of that section.

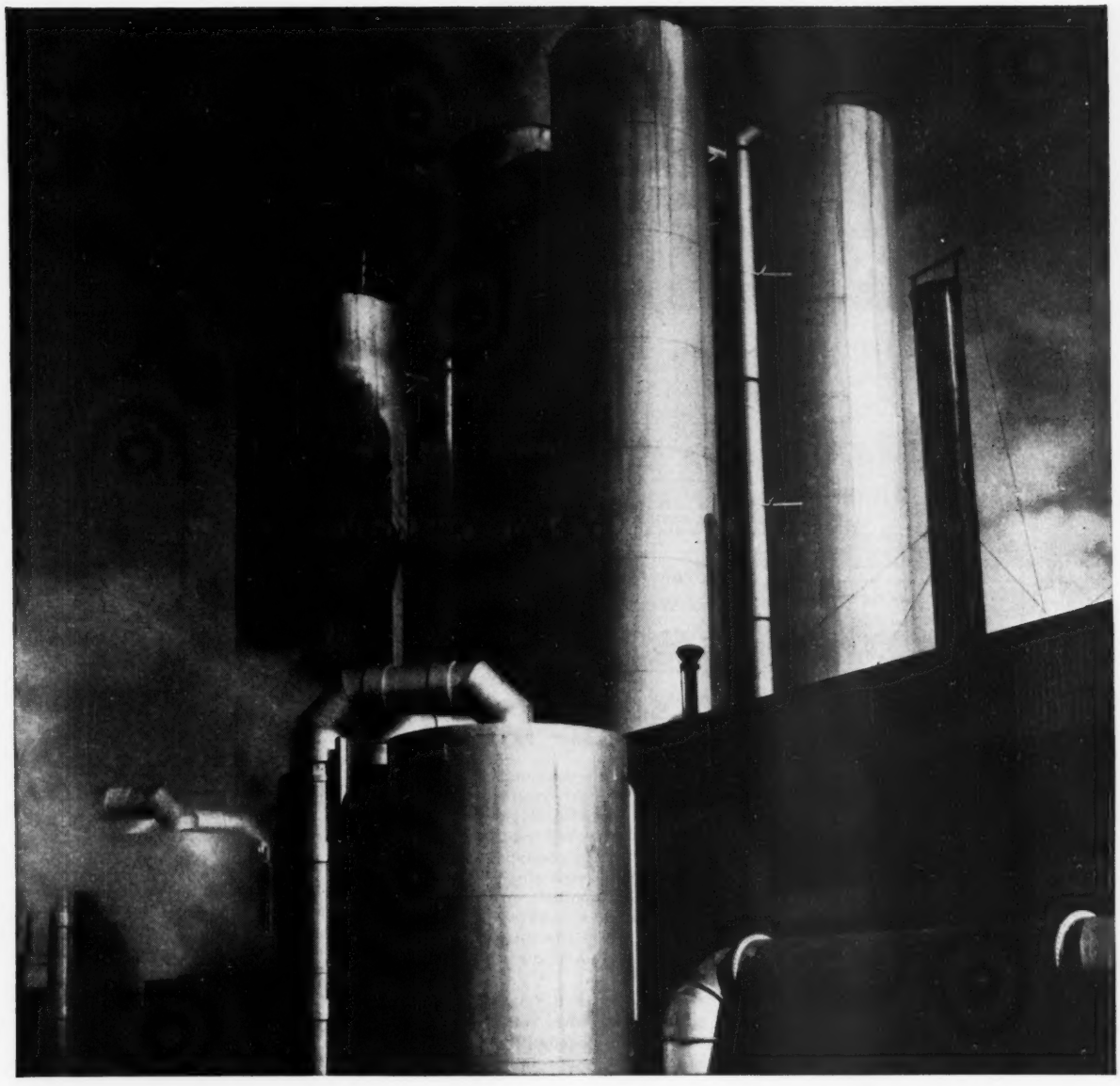
•

Kenneth L. Walker, formerly superintendent of the boiler shop at the Carteret (N. J.) plant of Foster Wheeler Corp, has been named superintendent of the new Mountaintop (Pa.) plant of the corporation. He joined the Foster Wheeler organization in 1934.

James S. Anderson, assistant general sales manager of the Tubular Products Division of Babcock & Wilcox Co at Beaver Falls, Pa., has been advanced to general sales manager. In another divisional appointment, Robert E. Halloran was assigned to the newly created position of manager of mechanical sales. Both Anderson and Halloran have been associated with Babcock & Wilcox since 1941. They will make their headquarters at Beaver Falls.

Robert P. Briggs, executive vice president of Consumers Power Co, has been named by Secretary of Defense Charles E. Wilson as a consultant of the Defense Department's Advisory Committee on Fiscal Organization and Procedures. Briggs, however, will continue in his regular duties with Consumers Power. With the Jackson, Mich., utility since 1951, Briggs has served as executive vice president for the past year. Prior to joining Consumers Power he was for six years a vice president of the University of Michigan.

Kenneth G. Patrick has been named manager of educational relations services in General Electric Co's Public Relations Services Division. He will be succeeded in his former post as manager of general public relations services by J. Stanford Smith, formerly manager of advertising and



There's a special paint for places like this and it saves hundreds of dollars

When you get down to figuring how much it costs to paint a square foot of tank or stack, you find that the paint itself is only a small part of the cost. That's why experienced paint buyers select more quality aluminum paints for jobs like this than any other type.

Because so much aluminum paint is used for these places, special formulas have been developed. Paints made to these formulas stand up longer under heat, cold, sun, rain and the kind of corrosive fumes you find around mills and factories.

We don't make paint. But we make the Alcoa Aluminum Pigments that are used in more aluminum paints than any other brand. So we want to be sure that you get full value from the aluminum paint you buy. It's just good business for us.

If you have a plant, or a stack, or storage tanks, or most anything else that needs paint that will last a long time, write us about your paint problem and we'll tell you what types of aluminum paints are best. We'll also send you a copy of *Painting with Aluminum*. It's packed with facts on selecting and using aluminum paints. Paint Service Bureau, Aluminum Company of America, 1787L Alcoa Building, Pittsburgh 19, Pa.

Alcoa Aluminum

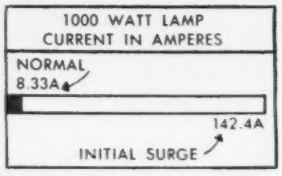
ALUMINUM COMPANY OF AMERICA

No. 2 in a Series Discussing Why ASCO® Means Adequacy in Automatic Transfer Switches

Why Your Automatic Transfer Switch Must Close Safely On Inrush Currents 20 X Full Load Rating!

On Tungsten Lamp Loads

Initial Current Surge May Be Almost **20 X Normal** Running Current



and

Lamp Wattage	Time for Current to Reach Maximum Value	Time for Current to Fall to Normal Value
	Seconds	Seconds
1000	.0031	.23

Current Drawn By A 1000 Watt Lamp Load Does Not Return To Normal For 0.23 Seconds!

ASCO Automatic Transfer Switches are adequately designed for this service. ASCO Switches will close against inrush currents 20 times Switch rating. These ASCO Switches have the thermal capacity to carry not less than 20 times full load current for one second! Overall "extra design", plus positive opening and closing permit this uniquely high current making capacity. This capacity prevents welding of contacts on high inrush current and insures proper switch operation. Smaller capacity switches will weld on high inrush currents, creating the hazard they were intended to eliminate—complete service outage.

ASCO Transfer Switches transfer the connected load from normal to emergency supply when normal fails, or is substantially reduced. Upon restoration of normal, the Switch will retransfer the load. ASCO Switches need not be derated:

1. **For Tungsten Lamp Loads**
2. **When Enclosed in a Cabinet**
3. **When Used for Continuous 24 Hour Duty**

The extensive ASCO line includes an Automatic Transfer Switch for every requirement — 10 to 1000 amperes — up to 750 Volt AC or DC.

Automatic Switch Co.

ASCO Solenoid VALVES

ORANGE, NEW JERSEY

FOR FULL INFORMATION MAIL COUPON TODAY!

ASCO Electro-Magnetic CONTROLS

AUTOMATIC SWITCH CO. 397 Lakeside Avenue, Orange, N. J.

Please send Free Booklet describing how to select an Automatic Transfer Switch.

Name & Title_____

Company_____

Address_____

City_____ State_____.

sales promotion for GE's Apparatus Sales Division at Schenectady, N. Y. Ralston B. Reid, who has been manager of program planning and research for the Apparatus advertising and sales promotion department since early this year replaces Smith in the manager's post. All appointments are effective Dec. 1.

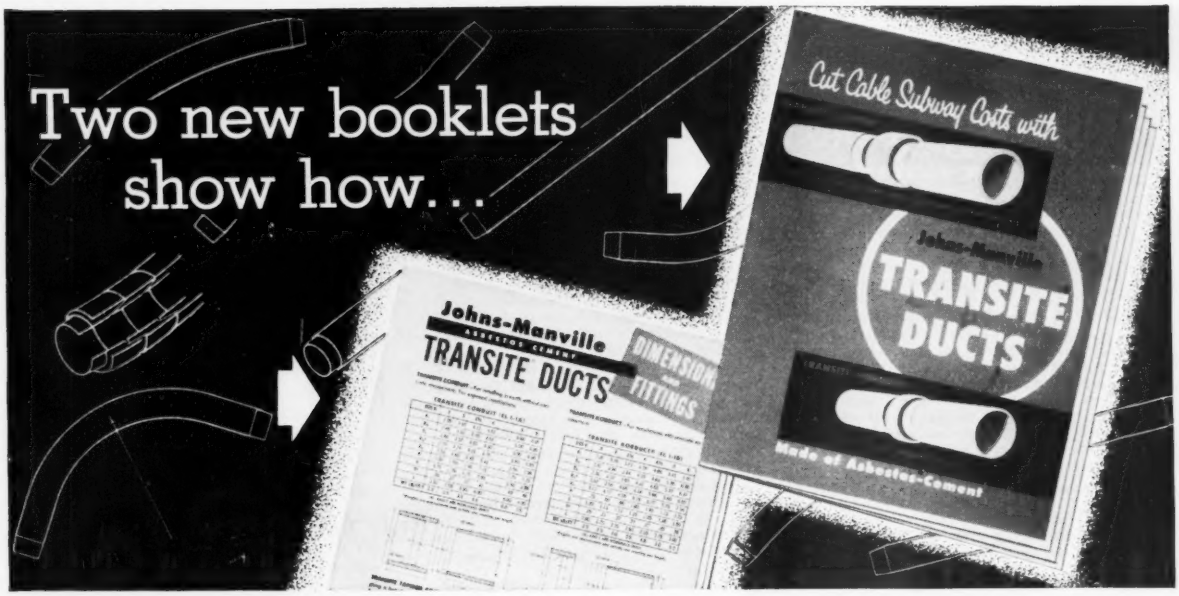
Maynard B. Wyman has been named manager and **H. C. Coleman,** assistant manager of the newly created engineering and service department of Westinghouse Electric Corp's Apparatus Division. Wyman joined Westinghouse in 1923 and Coleman joined the company in 1916.

Albert A. Flory has been made general manager of the Vermont operations of Citizens Utilities Co, Greenwich, Conn. Flory, who will make his headquarters in Newport, Vt., succeeds **Myron G. Clapper,** who will assume the post of Vermont sales manager to direct merchandising and load-building activities. Flory, formerly superintendent of Vermont Marble Co's Power Division, will take over the managerial duties on Dec. 1. Clapper, who recently completed 36 years' service with the Vermont operation, the last 12 as manager, will start his new assignment on Jan. 1.

Howard V. Barr has been appointed manager of the Clifty Creek Plant now being constructed on the Ohio River at Madison, Ind., by Indiana-Kentucky Electric Corp, a subsidiary of Ohio Valley Electric Corp. Barr, whose 35 years in power plants have been spent with the American Gas & Electric System, has been manager of Ohio Power Co's Tidd Plant since September, 1948.

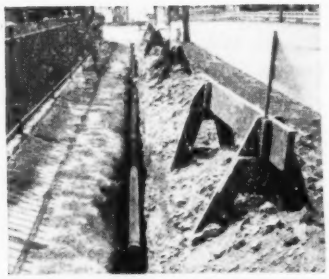
Merritt A. Peters, chief of plant accounting for Pennsylvania Power & Light Co, has been named assistant treasurer of the utility. In other Pennsylvania P&L changes, Roy A. Freeman, who served as assistant secretary and assistant treasurer for the past 11 years, has retired.

Hardy Shelby, district manager at Littlefield for Southwestern Public Service Co, Amarillo, Tex., has been appointed district manager at Lubbock. **Howard Horne,** Panhandle district manager since September, 1952, has been transferred to Littlefield as

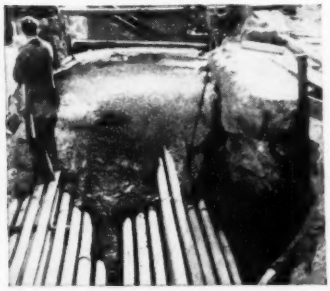


Transite® Ducts cut cable subway costs—

give greater cable protection



Transite Conduit is the thicker walled duct which is used for exposed work or is laid directly in earth without a concrete encasement. Saves time, labor and materials on the job



Transite Korduct® is the thinner walled duct for installation in concrete. Inasmuch as it is used principally for hi-voltage lines, its high thermal conductivity reduces operating losses

• Johns-Manville presents these brochures as a service to public utilities, design engineers, and all other users and planners of cable subway systems. "*Transite Ducts*" shows how improved cable subway protection, installation, maintenance and operational savings may be achieved. "*Transite Ducts, Dimensions and Fittings*" give the necessary dimensional data on all ducts and fittings.

Transite Ducts offer improved cable subway protection. Made of asbestos and cement, Transite cannot burn, smoke, fume or generate explosive gases. Transite confines arc damage and protects adjacent cables against heat and flame. Transite resists corrosive action of soils; is unaffected by electrolysis.

Installation savings result because Transite is strong, light in weight, easy to handle. It comes in long, 10-foot sections, thus, fewer joints are required. Its permanently smooth bore prevents injury to cable either from natural movement or when pulling cable through. Maintenance savings result from the permanent nature of the asbestos cement composition of Transite. It is as durable as stone.

Moreover, operational savings result because cables run cooler due to the high thermal conductivity of Transite Ducts. This also results in prolonged cable insulation life.

For complete details on how Transite Ducts can cut cable subway costs for your system, send for copies of "Transite Ducts," EL-29A and "Dimensions and Fittings," EL-45A. Write to Johns-Manville, Box 60, New York 16, New York. In Canada, 199 Bay Street, Toronto 1, Ontario.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE DUCTS

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

Quality FAST Capacitors

That Which Follows

Getting to the bottom of things

The impregnation of capacitors is a very critical operation. This operation is divided into two phases. The first phase is to dry and degas the assembled unit. The second phase is to saturate the winding completely and fill the container with the impregnating liquid. The better the job of impregnation, the higher the quality of the capacitor.

John E. Fast & Co. assures the superior quality of its capacitors because of the uniformly high standards which must be met at each stage of operation. After the units are placed in tanks and the tanks sealed, the heating cycle is started. The next step is to evacuate the tanks. This cycle continues until there is a vacuum of 100 microns or lower. (Our usual is 50 microns.) This completes the first phase of the operation.

While the vacuum cycle is progressing, the liquid (Aroclor) is being filtered and treated. We have an electronic device which controls this filtering process and records the continuous test results. The liquid must meet the specified requirements of dielectric constant, power factor, and purity before this device opens the valve to allow the liquid to enter the tank.

Capillary action draws the impregnant to the center of the windings, therefore eliminating any chance of dry spots. After the windings are completely saturated, pressure is used to force the liquid into every corner and crevice of the unit. Next comes another temperature cycle, during which the units are maintained at the proper sealing temperature for a period of hours, after which they are quickly sealed.

It must be apparent, from the process-outline above, that the quality of a capacitor can be no better than the precise control maintained in the impregnation cycle . . . irrespective of the excellence of materials used in the assembly.

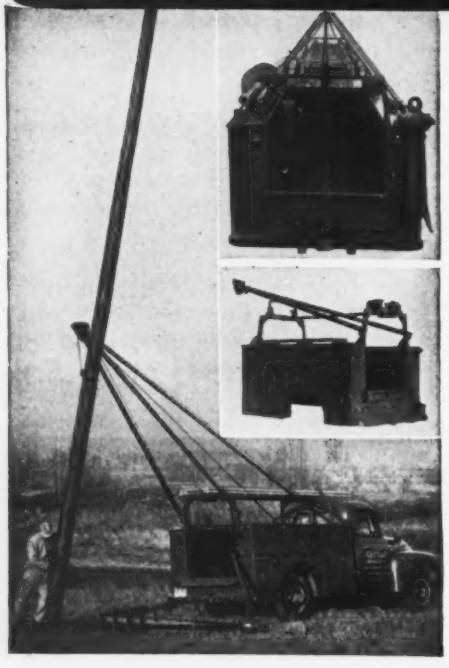
The FAST organization rigidly adheres to the highest standards from basic materials to processing, through life-testing to the finished product, as was covered in the three earlier items in the series "Getting to the Bottom of Things"—thus substantiating our claim to being *Capacitor Specialists.*

JOHN E. FAST & CO.
Capacitor Specialists For Over A Third of A Century
3165 North Pulaski Road, Chicago 41, Ill.
"WHEN YOU THINK OF CAPACITORS . . . THINK FAST"

AVAILABLE LITERATURE
JAN C-25 APPROVED CAPACITORS:
Refer To Jan C-25 "Specifications"
POWER-FACTOR CORRECTION CAPACITORS:
Sections I, II, III, IV, Catalog No. 27

Quality FAST Capacitors

Two-Man
COMBINATION TRUCKS
Pay Dividends



With a ¾ or 1-ton truck and Tel-E-Lect "Combination" Body, you can . . .

- **Dig holes and set poles up to 40'**
- **Handle your regular service work**
- **Reach a variety of jobs quicker**
- **Operate with two men at less cost**

IT'S A COMPLETE PACKAGE, tailored for your make and model of truck. Derrick, winch and digger drive are all assembled to the body, ready for your truck chassis. Easily mounted in a few hours by your local mechanic.

Write for Bulletin

TEL-E-LECT
PRODUCTS, Inc.
10003 Minnetonka Blvd., Minneapolis 16, Minn.

district manager to replace Shelby. The appointments are effective Dec. 1.

R. W. Jennings, formerly area engineer at Grand Junction, Colo., for the Bureau of Reclamation, has been made Alaska district manager at Juneau to succeed **Joseph M. Morgan,** who has been given a new assignment with the bureau's office in Washington, D. C.

Harry A. Winne has retired as vice president of General Electric Co after 43 years' service. Winne, who has been on special assignments for GE President Ralph J. Cordiner since May, will continue his headquarters at company offices in Schenectady, N. Y., until the end of the year to complete those assignments. A leading expert in the field of atomic energy, he was named in 1946 to a board of consultants to aid the government's Committee on Atomic Energy. Winne recently was named recipient of the Manufacturers Medal by the Committee of the James H. McGraw Award for Electrical Men (EW, Nov. 16, p 108).

Wilbur N. Marx, general superintendent of the Sioux Falls (S. D.) Division of Northern States Power Co, has been named manager of the Southwestern Division at Montevideo to succeed **Carl F. Blackman,** who will be transferred Dec. 1 to the Minneapolis general offices of the utility. Blackman served as manager at Montevideo for ten years.

Robert Ashbrenner, Bureau of Reclamation electrical engineer, will become superintendent of the power plant at Canyon Ferry Dam, Mont., when construction of the project is completed and the plant is put in operation. Ashbrenner, who has worked for the bureau on various power line construction jobs in Montana, first came to Canyon Ferry to supervise construction of a power line from the dam site to the Montana Power Co distribution system.

OBITUARY

James J. Ashworth, 85, former general manager of the Canadian General Electric Co, died Nov. 18 at Toronto, Ont. He was made general manager of the company in 1921 and retired in 1940.

THIS OIL PURIFIER KEEPS YOUR DIELECTRIC YOUNG!

ADVANTAGE OF DE LAVAL PORTABLE OUTFIT	WHAT THIS MEANS TO THE POWER ENGINEER
✓ Purification is carried out at safely low temperatures. The heater cannot carbonize the oil.	✓ High dielectric value of the oil maintained longer.

Constant high purifying efficiency–no shutdowns for cleaning or for renewal of parts during run ✓

Dehydrates at a single pass–no re-running

Higher daily capacity of insulating oil saves maintenance costs ✓

Heater cannot carbonize the insulating oil

Safest–continuous discharge of water prevents re-contamination of the insulating oil ✓

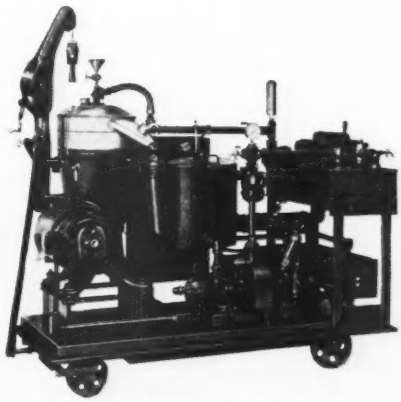
Centrifugal purifier is economical to operate

Removes free water without aid of filter press; press used only to remove colloidal carbon ✓

Low temperature purification; high dielectric value of oil maintained longer

De Laval purification is accomplished by centrifuging the oil at safely low temperatures. Such low temperature purification is an important advantage, for the solubility of insulating oil increases with temperature. If oil is heated considerably above 90°F before water is removed, some free water will be driven into solution. The result would be that while a relatively high dielectric test might be obtained immediately after purification at the higher temperature, a great part of the improvement may be lost when the oil is cooled to normal temperature, releasing dissolved water again from solution.

De Laval Portable Insulating Oil Purifiers maintain the dielectric longer . . . more safely . . . more economically!



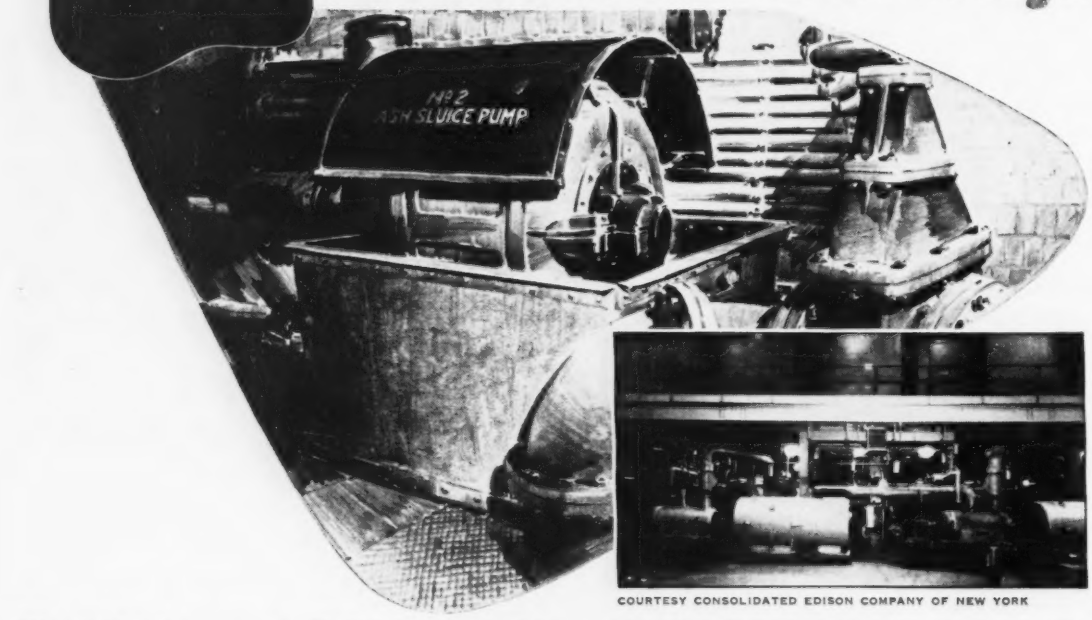
✓ CHECK THESE DE LAVAL SUPERIORITIES

THE DE LAVAL SEPARATOR COMPANY
Chicago POUGHKEEPSIE, N.Y. San Francisco

DE LAVAL INSULATING OIL PURIFIERS

DOW CORNING
SILICONES

make motors last longer



COURTESY CONSOLIDATED EDISON COMPANY OF NEW YORK

World's Largest Utility Specifies Class H Insulation for Reliability

When millions of customers depend on you for 24 hour a day service, you can't take chances with your equipment. That's why the Consolidated Edison Company of New York took immediate action when a 350-hp Class A insulated sluice pump motor failed 3 times in one year.

Although repeated overloading was the primary cause of failure, ambient temperatures were kept high by an enclosure built around the motor for flood protection. Failure rate was cut to once a year by rewinding with Class B insulation. The motor was then rebuilt with Class H (silicone) insulation. That was 9 years ago, and it is still in service.

That was Consolidated Edison's first experience with Class H. Since then, many other motors have been rewound with Class H to withstand tough operating conditions. Over 79% or 71,700 out of a total of 90,500 horsepower in new motors bought for major auxiliary installations have been Class H insulated.

Consolidated Edison has also pioneered the use of Class H insulation in sealed dry-type unit substation transformers. They estimate that the cost of such units is more than competitive with conventional installations for power plant auxiliary supply. Convenient and safe, the Class H transformers can be located almost anywhere. And the cost of cable, switchgear, fire protection and related equipment is greatly reduced. That's why Consolidated Edison has already bought eighty-one 1250 KVA Class H transformers for unit substation work, and twelve 1000 KVA units for miscellaneous light and power.

No wonder engineers and management men throughout industry now specify Class H insulation made with Dow Corning Silicones to get as much as 50% more overload capacity or 10 times the life of electrical equipment built with the next best class of insulation.

mail this coupon today

DOW CORNING CORPORATION, Midland, Mich.
Please send me: **Dept. AY-11**

- ☐ Performance data on Class H equipment
- ☐ Data on Silicone Grease for motor bearings
- ☐ 32-page booklet entitled "What's A Silicone?"

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Northwest Aluminum Output...

. . . is expected to be kept at full capacity now that Interior agencies and three producers have signed agreements for power

Favorable water conditions in the Pacific Northwest plus new hydroelectric capacity brought on the line the past year has permitted Interior department agencies and three aluminum companies to sign agreements that will keep regional ingot production at full capacity for the nation's defense needs.

Reynolds Metals Co, Aluminum Co of America, and Kaiser Aluminum & Chemical Co normally drop loads of up to 320,000 kw under their interruptible contracts which take effect anytime after the beginning of the storage season in September.

DMA Plea . . . Secretary of the Interior Douglas McKay announced the plan via Bonneville Power Administration Chief Paul Raver after a plea from Arthur S. Fleming, director of the Defense Mobilization Administration.

Advance release of storage from the vast pool behind Hungry Horse Dam in Montana, up to 200,000 acre ft, will provide 150,000,000 kwhr of energy from downstream installations and some 15 million lb of aluminum to the nation's strategic metals stockpile.

Kaiser will take about 50% of the energy for its Spokane and Tacoma mills; Alcoa, 15% at Wenatchee and 10% at Vancouver, Wash.; and Reynolds will get 20% at the Troutdale, Ore., plant.

One Year Agreements . . . Raver reported the agreements are for one year and said:

"Current favorable water conditions with better than median flows in the first two months of the storage season, plus new generation added at McNary and other federal dams make possible this interim defense commitment.

"The risk of power deficits resulting from premature release of Hungry Horse storage will be assumed by the aluminum companies. They agreed to restore the power by purchase of steam or other nonfederal generation if such deficits should occur."

Other Users Protected . . . Raver emphasized that power supplies of all public and private utilities will be fully protected, although ordinarily the Hungry Horse storage is held in reserve to meet commitments later in the winter. A factor in the improved hydro power supply situation was McNary's first 70,000 kw generator now on the line and another scheduled agreement won't be noticeable until late December, when more severe weather in the watersheds normally affects streamflows. If the mild weather of this 1953 fall and early winter persists, there is a chance no interruption of power to the other industries of this class will be required.

Bonneville Power Administration has 12 direct industrial customers, most of whom purchase substantial amounts of energy on an interruptible basis when the power is available.

The new interim agreements are also subject to termination on the same basis of existing contracts for interruptible.

William A. Dittmer, former BPA power manager now employed by Kaiser Aluminum, is reported to be the father of the agreements signed by the Interior agencies and the aluminum producers.

$4 Million Saving . . . With the agreements, BPA now stands to increase its revenues by as much as $1 million without risking a cent. However the aluminum producers could save as much as $4 million in operating costs if the plan succeeds, or drop a sizable per cent of that amount if water conditions are not favorable.

Object of the aluminum producers is to keep their power costs as close to the federal rate of two mills per kilowatt hour as they can since this represents a big share of their production costs. Even at this low rate, the power required figures at something over 10% of the overall production cost of pig aluminum.

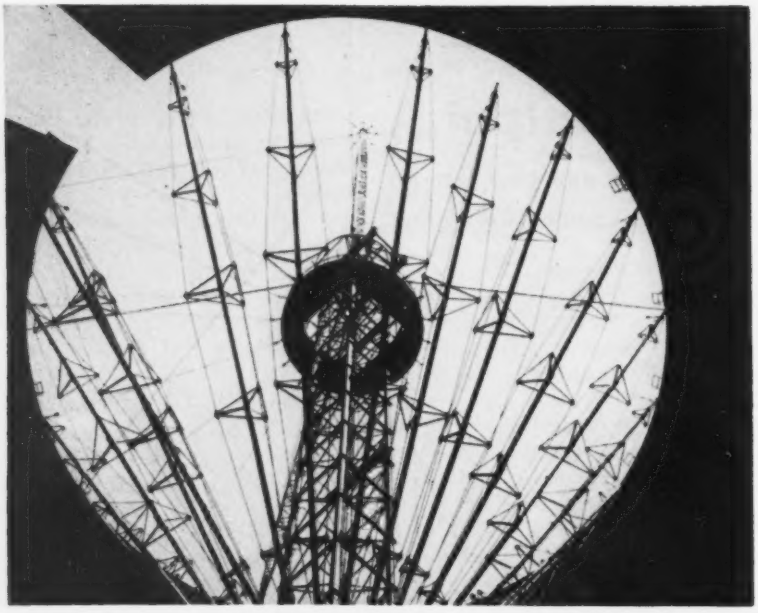
2 GE Workers Suspended

General Electric Co suspended two Lynn, Mass., plant employees after they invoked the 5th Amendment at recent hearings on Communist cells in GE plants held in Boston by the Senate Permanent Subcommittee on Investigations, whose chairman is Sen Joseph R. McCarthy (R. Wis.). GE said Nathaniel Mills and Robert Goodwin were suspended "pending our investigations and determination." However a statement regarding the overall investigation of General Electric plants was not available earlier this week from GE's New York headquarters. Earlier this month Sen McCarthy had questioned at closed sessions 18 witnesses about infiltration of Communist agents in General Electric's Schenectady, N. Y. plant (EW, Nov. 23, p 45).

It was at the Boston hearings that William H. Teto, a 53 year old upholstery supply dealer formerly employed by General Electric, testified under oath that Communist cells were active in General Electric plants at Lynn, Fitchburg, and Everett, Mass., and Schenectady, N. Y. At that time he disclosed that he was a Federal Bureau of Investigation undercover agent who had been counterspying on Communist cells in General Electric Co plants since 1941. He left General Electric in 1946.

Two witnesses at the hearings who also invoked the Fifth Amendment now face charges brought by fellow union members according to Earl J. Riley, business agent of Local 201, International Union of Radio, Electrical and Machine Workers, CIO union at the GE plant at Lynn, Mass. The workers are Henry C. Archdeacon and Donald H. Morrill.

Riley has revealed that Nathaniel Mills of Lynn had been expelled from the union October, 1952. He added that Robert Goodwin never had been accepted for union membership because of knowledge that he was a Communist.



Steel Tower, Booms Were Used . . .

. . . to Erect 'Globe' for A-Submarine

The steel tower and booms at top were used for erecting a 225-ft steel sphere (bottom) at West Milton, N. Y., which was constructed to test an atomic power plant for U. S. Navy submarines. The completed sphere, which rises as high as an 18-story building with its 3,850 tons of steel, was built for the Atomic Energy Commission. It is part of the facilities of the Knolls Atomic Power Laboratory, which is operated by General Electric Co for AEC. General Electric is currently working on a power plant for atomic submarines.

GE plans to install a new type of fission reactor in a section of a submarine hull which will be moved inside the sphere, where conditions at sea will be simulated.

MEETINGS CALENDAR

American Society of Mechanical Engineers
Annual Meeting, Statler Hotel, New York, Nov. 29-Dec. 4; Semi-Annual Meeting, William Penn Hotel, Pittsburgh, June 20-24.

Edison Electric Institute
Prime Movers Committee, Astor Hotel, New York, Nov. 30-Dec. 1; Street Lighting Committee, Dayton, Ohio, Dec. 1-2; EEI-AGA General Accounting Committee, Jung Hotel, New Orleans, Nov. 30-Dec. 1; Commercial Lighting Committee, Detroit, Mich., Dec. 2-3; EEI-AGA Customer Accounting Committees, Netherlands Plaza Hotel, Cincinnati, Ohio, Dec. 3-4; Financing and Investor Relations Committee, EEI Headquarters, New York, Dec. 9; Commercial Cooking and Water Heating Committee, Tutwiler Hotel, Birmingham, Ala., Dec. 10-11; Industrial Power and Heating Section, Sheraton Hotel, St. Louis, Dec. 10-11; EEI-AGA Accounting Employer Relations, Hotel Cleveland, Cleveland, Ohio, Dec. 14; Commercial Electrical Space Heating and Air Conditioning Committee, Canton, Ohio, Dec. 17-18; Industrial Relations Committee, EEI Headquarters, New York, Dec. 17; Accident Prevention Committee, Hotel Statler, Boston, Jan. 18-19; Industrial Relations Committee Joint Meeting with Personnel Administration Section, Southeastern Electric Exchange and Southwestern Personnel Group, Hotel Roosevelt, New Orleans, La., Jan. 21-22; EEI-AGA Taxation Accounting Committee, Arlington Hotel, Hot Springs, Ark., Jan. 27-29; Transmission and Distribution Committee, Hotel Cleveland, Cleveland, Ohio, Feb. 9-10; Electrical Equipment Committee, Sheraton Cadillac Hotel, Detroit, Mich., Feb. 15-16; Industrial Relations Committee, EEI Headquarters, New York, March 18; Sales Meeting, Edgewater Beach Hotel, Chicago, April 5-8; EEI-AGA Accounting Conference, Hotel Statler, Boston, April 12-14; Industrial Relations Committee, Netherlands Plaza Hotel, Cincinnati, Ohio, April 15; Annual Meeting, Atlantic City, N. J., June 1-3.

Public Information Program
Inter-Regional Committee, Monticello Hotel, Norfolk, Va., Dec. 4; Steering Committee, Hotel Biltmore, New York, Dec. 11.

Interstate Power Club
Hotel Martinique, New York, Dec. 7.

Eastern Joint Computer Conference-Exhibition
Sponsored by Institute of Radio Engineers, Association for Computing Machinery, and American Institute of Electrical Engineers, Statler Hotel, Washington, D. C., Dec. 8-10.

***Public Utilities Advertising Association**
Region Two, Annual Meeting, Skytop, Pa., Dec. 10-11; Region 5 Meeting, Atlanta, Ga., Feb. 11-12; Region 1 Meeting, Montreal, Mount Royal Hotel, Que., Feb. 25-26; National Convention, Hotel Statler, Boston, May 13-14.

American Institute of Electrical Engineers
Winter General Meeting, Statler Hotel, New York, Jan. 18-22; Conference on Feedback Control, Claridge Hotel, Atlantic City, N. J., April 22-23; Northeastern District Meeting, Schenectady, N. Y., May 5-7; Summer General and Pacific General Meeting, Hotel Biltmore, Los Angeles, June 21-25; Conference on Telemetering, Morrison Hotel, Chicago, May 24-26.

Industrial Electrification Council
National Industrial Electric Heating Conference, Netherlands Plaza Hotel, Cincinnati, Ohio, Jan. 18-22.

Electrical Equipment Representatives Association
Winter Annual Meeting, Biltmore Hotel, Los Angeles, Feb. 8-11.

National Electrical Manufacturers Association
Spring Meeting, Edgewater Beach Hotel, Chicago, March 8-11.

American Power Conference
Sherman Hotel, Chicago, March 24-26.

*Addition this week.

Still in service after 28 years these Dayton Power & Light poles are protected by Creosote

● Not a single failure due to decay—that's the record of 140 poles installed with Creosote protection in 1925 by Dayton Power and Light Company on its Bloomingburg line near Washington Court House, Ohio.

Highway relocations and company developments requiring higher poles have led to removal of many of the poles, but all were reinstalled and are still in service.

Tests, including borings, were made in 1952 on several poles by the Company's Material Research Department. The poles were found to be tough, hard and difficult to bore; penetration at all points was still deep and the general condition of the poles was good.

* * *

This is the kind of service you can expect when your poles and crossarms are pressure-treated with Creosote. And it is the reason why Creosote is the most-used wood preservative.

For Creosote that is always uniform in quality, ask your treater to use U·S·S Creosote. For complete information, contact our nearest Coal Chemical sales office or write directly to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

DATING NAIL on one of the poles indicates it was first put into service in 1925.

CLOSE-UP of one of the poles at the ground line showing its excellent condition.

PRESSURE-CREOSOTED southern yellow pine poles in the Bloomingburg line of Dayton Power and Light Company near Washington Court House, Ohio.

U·S·S CREOSOTE

UNITED STATES STEEL

3-1078

FOR EXTRA YEARS OF EASY-TO-SEE SAFETY

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KEARNEY
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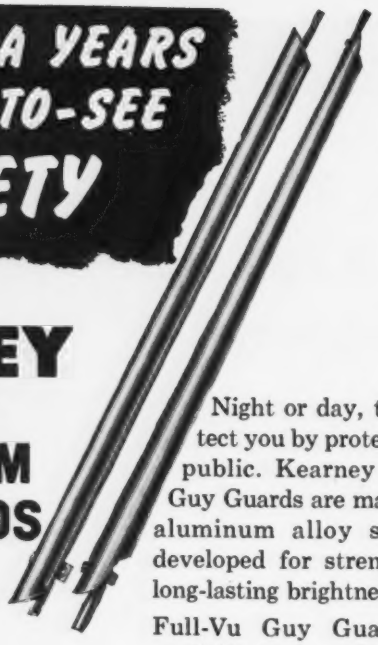

Night or day, they protect you by protecting the public. Kearney Full-Vu Guy Guards are made of an aluminum alloy specially developed for strength and long-lasting brightness.

Full-Vu Guy Guards are available in a complete line of full-round and half-round seven and eight foot lengths.

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For Better Construction - For Safer Maintenance

SAVE up to 85% brush handling costs.

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TECHNICAL LITERATURE

NEMA Standards for Metallic Rectifiers—Publication MRI-1953, April, 1953, 47 pages, has been released. These standards provide practical information concerning the rating, manufacture, testing, performance and application of metallic rectifiers. Available at $3.50 from National Electrical Manufacturers Association, 155 East 44th St, New York 17, N. Y.

The L3 Coaxial System—Monograph 2090 has been issued by the American Telephone and Telegraph Co. The articles in this issue are devoted to different phases of the development of a new system for the transmission and utilization of broader frequency bands on existing or new coaxial cables. System Design, Equalization and Regulation, Amplifiers, Television Terminals, Quality Control Requirements, and Application of Quality Control Requirements in the Manufacture of Components are separately authored sections on the new Coaxial System. Direct requests to Bell Telephone Laboratories, Inc, 462 West St, New York 14, N. Y.

New Scheme for Analysis of Industrial Water—Babcock & Wilcox Co, Research Center has released a preprint of its paper as prepared for presentation at the American Chemical Society meeting at Chicago, Sept, 1953. The new scheme divides the properties and constituents of water into four principal categories based on their being affected or unaffected by contact with the atmosphere, and according to the type of sample or sampling conditions required. The scheme will be an important analytical aid to the boiler industry and other users of industrial water. Refer to A.S.T.M. D 1256-53T or direct requests to Babcock & Wilcox Co, Research Center, Alliance, Ohio.

Carbon and Alloy Steel Tubing & Pipe Data—Announcement has been made of a six page folder on tubing and pipe for high temperature-pressure service by Babcock & Wilcox. Data on analyses, mechanical and physical properties, creep strength, short-time elevated temperature tensile properties, oxidation resistance, and other pertinent information, is presented on a complete series of tubing steels. Write for TDC 163 to Tubular Products Division, Babcock & Wilcox Co, Beaver Falls, Pennsylvania.

Bibliography On Electrical Contacts—Announcement has been made of the publication of "Bibliography and Abstracts On Electrical Contacts", 266-pages, by the American Society for Testing Materials. Last published in 1944, the new bibliography includes articles on contact materials and methods of testing, and on the interruption of electrical circuits, covering the period from 1835 through most of 1951. Bound in a hard cover, indexes of both subjects and authors are included, and the abstracts are proportioned in relation to the significance of the work. Availability is at $5.50 per copy from American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa. Designation is Special Technical Publication No. 56-G. Subsequent supplements are also available.

Right-of-Way Brush Killing—Announcement of its report on the third year of research on Chemical Brush Control on Rights-of-Way has been made by Thompson Chemicals Corporation. Over 3000 acres in the rugged terrain of Arkansas and Missouri Ozark regions were used in the research, in cooperation with the United States Department of Agriculture. Reduced chemical and application costs are reported for both foliage spraying and basal bark application using aircraft, truck, tractor and knapsack sprayers. Ask for Station Paper 12 from Thompson Chemicals Corp, St. Louis 3, Missouri.

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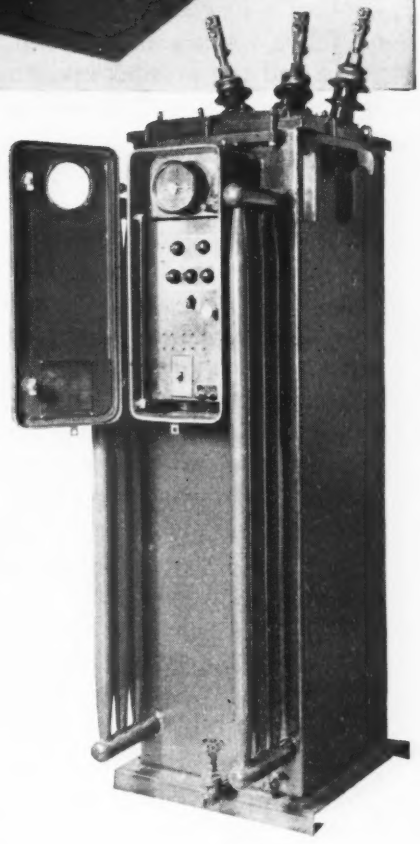

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The second of two articles on profits

What Are PROFITS Used For?

This is the second article on the role of profits in our economy. The first was addressed to the question: "How High are Profits?" The answer was found to be: not high when compared with previous years and the present investment in corporate facilities. This second article is addressed to the equally important question: "What do corporations do with their profits?"

In 1953 corporations will earn about $20 billion *after taxes*, if the recent rate of earnings is maintained throughout the year. These profits will be used (1) to expand and improve productive capacity through purchases of new plant and equipment, (2) to finance the operations involved in a growing volume of business and (3) to reward the people who have invested their money in American industry. Of the $20 billion, the corporations will pay about $9 billion to their stockholders as dividends. They will use the $11 billion that remains to purchase new plant and equipment and to increase their working capital.

This year corporations are increasing their plant, equipment and working capital by a total of approximately $32 billion. Of this amount, about $26 billion is for new plant and equipment. The remainder is for working capital. As this article will show in greater detail, about $21 billion of this will come from depreciation allowances and sales of new securities. The other $11 billion will come from retained profits.

It is impossible to trace exactly how each dollar of retained profits is spent. This money is mixed with other money that goes into the company treasury in the form of proceeds from loans, sale of securities and depreciation allowances. *However, it is a fact that by retaining $11 billion of their profits this year, corporations have provided $11 billion toward their total capital requirements, including the money needed for expanded and improved capital equipment.*

Profits Mean New Plants

This year American industry is engaged in a very large expansion of plant facilities. This will increase the industrial capacity of the nation by about 7 per cent. Since 1950, our capacity has been increased by about 12.5 per cent. And all of this expansion has been privately financed, even though about one-third of it was certified as necessary for national defense.

The expenditure during 1953 of $26

billion for new plant and equipment—an alltime record—imposes terrific financial responsibilities on our corporations. About one-half of the amount required will come from depreciation allowances. In general, these allowances are supposed to pay for the replacement of worn-out or obsolete equipment. Another $8 billion will be raised by corporations through new security issues and long-term mortgage loans. All together, depreciation allowances, security issues and long-term loans will provide about $21 billion. But this is still $5 billion short of the $26 billion needed for new plant and equipment this year. Thus, it is retained profits that spell the difference between expansion and standing still, between growth in the productive capacity of the economy and running downhill.

As plant facilities are expanded, corporations also need more working capital. A larger volume of business requires larger inventories, larger accounts receivable and larger amounts of ready cash to meet payrolls and bills for materials. The increase in these items during 1953 is estimated at $8.5 billion, of which about $2.5 billion will be supplied by short-term bank loans. The other $6 billion will come from retained profits. Thus, retained profits provide an essential $11 billion—$6 billion for working capital, $5 billion for new plant and equipment—to meet corporate financial requirements.

Incentive for Investment

The role of the profits that are paid to stockholders as dividends or to employees under profit-sharing plans is even more important than the role played by retained profits in providing plant, equipment and working capital. Dividend payments provide the main incentive for investment in the stocks of corporations. They are the reward for risks taken by investors. Dividends paid by corporations whose common stocks are listed on the New York Stock Exchange provide an average return of about 6.5% at present prices, and dividends on preferred stocks average about 4.5% return. Dividends are distributed among 6.5 million stockholders. Also, it is estimated that 3 million employees now are covered by profit-sharing plans. These plans increase the incentives of both production workers and managers to work harder and more efficiently.

Thus, more than 9 million Americans have a *direct* financial stake in corporate profits through ownership of stock or participation in profit-sharing plans. But *all* Americans share indirectly in the rewards of a successful business year. Investment of a major part of 1953 profits in new plants and equipment means more employment opportunities and better working conditions for labor. For the nation, it means new industrial capacity that is essential both for national defense and to produce more and better goods for a rising standard of living.

Corporate profits after taxes represent about 6% of the nation's total income. But the job they do to stimulate investment and to finance industrial expansion and improvement is more far-reaching and more essential to the prosperity and well-being of the American people than would be suggested by that small figure.

McGraw-Hill Publishing Company, Inc.

Radio Telephony

Advances and problems in field discussed by IRE group at Boston conference

Recent progress in mobile radio telephony was discussed at convention of the National Professional Group on Vehicular Communications, Institute of Radio Engineers, held Nov. 12-13 at Boston. Many representatives of utility companies were among the 300 persons attending the parley.

Waldo A. Shipman, group chairman, pointed out that over 600,000 transmitter-receivers are now in service in commercial motor cars and trucks apart from military units. This, he said, has resulted in "channel-crowding" in many areas, with resulting mutual interference.

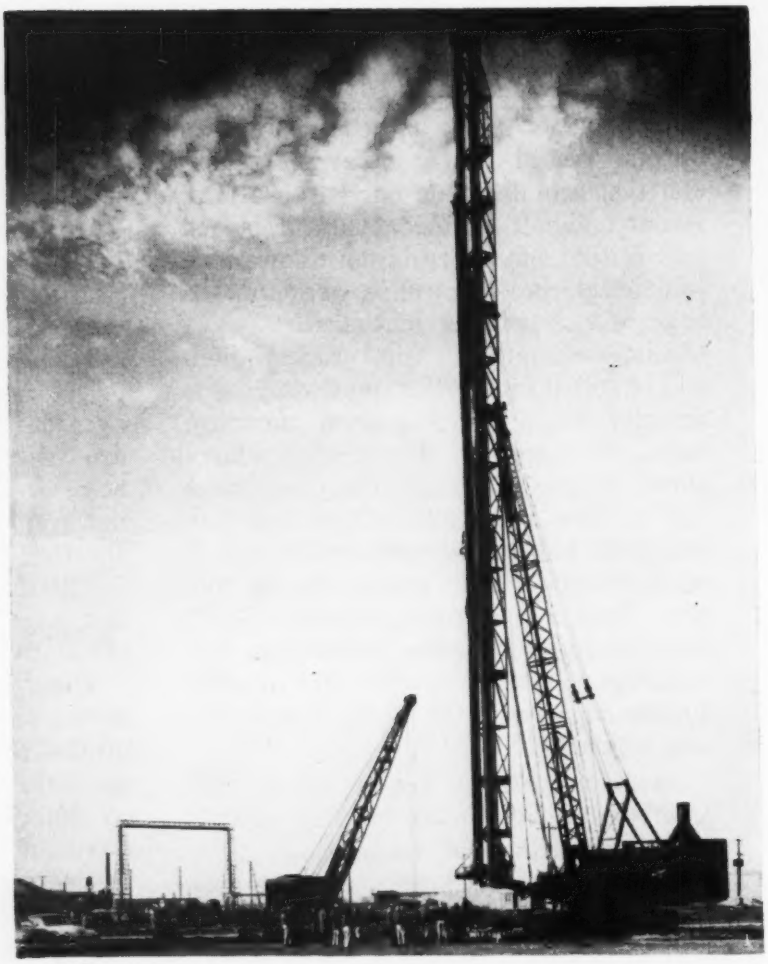
FCC Studies . . . Federal Communications Commissioner E. M. Webster stated that close study is being given by FCC to possible new methods of frequency allocation, channel splitting, the development of the 450-460 mc band, equipment standards, and licensing procedure. He said the commission is asked to process about 30,000 land mobile radio applications yearly. Split channel assignments may prove feasible in systems of smaller area, the FCC commissioner noted, but it is no panacea. He said efficient spectrum utilization requires the space allowed for frequency tolerance be as occupied by the modulated signal.

Webster said the commission eventually will remove the developmental classification from the UHF mobile services. It may establish minimum standards of receiver performance as regards interference, he remarked. Webster also said licensing by systems as such is being studied.

G. E. Dodrill and J. F. Atkinson, Rural Electrification Administration, described various types and combinations of radio relay schemes for electric power systems, for extending communication ranges. FCC now is considering adoption of more stringent rules for use of 72-76 mc, they said. The REA men pointed out that use of 450-460 mc frequencies in fixed service is subject to the condition that harmful interference shall not be caused to mobile units in that band.

Operating Problems . . . In an address to the group, D. E. York, United Fuel Gas Co, Charleston, W. Va., reviewed operating problems of radio on 34,000 miles of gas pipe lines in 7 states served and also covered power utility operations. Lighting loss has been minimized, he said, by lowering tower-to-ground resistance, use of protective devices, installing line capacitors, and protecting control lines by thermal relays and cartridge type fuses. York pointed out that radio control in the 72-76 mc band was desirable on account of lower initial cost.

Columbia's major problem with 450 mc operation for control, York said, was due to icing of its 4-element yagi antennas, causing loss of signal. This was solved, by installing helical beam antennas encased in plastic, he said. York noted that about 90% of the mobile installation are in ¾-ton trucks. The problem of finding space for the radio outfit was met by one company at a cost of about $50 per truck by rebuilding the vehicle seat to provide clearance for under-seat mounting, he declared.



A Rig to Dig the Rouge Foundations

This sky-high rig has begun to drill holes and drive steel casings 90 feet into the ground prior to laying the foundations for Detroit Edison's River Rouge Power Plant. The casings—3,000 of them—will be filled with concrete to support the foundations for two 260,000-kw steam turbines, said to be the largest in the world. The units are scheduled to go on the line early in 1956. Site of the plant is on the Detroit River front near the mouth of the Rouge. The plant, of steel panel design, will have dock space for lake colliers. Storage for more than a million tons of coal has been provided.

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Financing Record

(*Continued from page* 100)

July; 3.61% on a $35 million, 3¾% issue of Duke Power Co marketed in early September; and 3.52% on a $12 million, 3⅝ issue of Duquesne Light Co sold September. At the end of the month Indiana & Michigan Electric Co placed an issue rated AA with the public at a price to yield 3.50%. Each of these issues was sold to underwriters through competitive bidding.

Interest Rates Downward . . . During October all interest rates continued downward, except the "prime rate" commercial banks charge borrowers with the best credit ratings. This rate has remained at 3¼ since April of this year. The cost of 91-day bills came down to 1.22% in late October but rose to 1.48% in the second week of November.

During the final week of October two electric companies offered, through underwriters, mortgage issues rated AA at prices to yield $3.18% and 3.22%, considerably below the yield of 3.50% obtained from the purchase of a comparable issue at the end of September. However, it should be added that the underwriters had been too optimistic. Each syndicate was terminated after ten days of unsuccessful selling efforts, and the bonds fell below the original offering price.

Changes in money market conditions did not have the same impact on prices in the secondary bond market until after the end of the third quarter. The average yield of first quality bonds compiled by Reis & Chandler, Inc, went from 3.37% in the middle of June to 3.32% at the end of June, stood at 3.31% in the middle of September, and dropped to 3.26% at the close of the month. Since then higher bond prices have lowered yields, and the first quality bond average dropped to 3.06% in the first week of November.

Preferred Stock Offerings Halted . . . New public offerings of preferred stock issues came virtually to a halt during the third quarter of this year, following a period of activity during the first six months when 21 electric companies sold preferred issues. A Wisconsin Power & Light Co offering of a $2 million issue, initially to its preferred stockholders, was the only public sale.

Common stock offerings amounted to $115,116,000 during the quarter compared with a figure of $44,663,000 during the third quarter last year. Pacific Gas & Electric Co's $65 million offering to stockholders accounted for more than half the latest three months' total. This is the seventh time since the war that stockholders of this company have been asked to aid in the financing of a construction program which crossed the billion-dollar mark this year. Each time stockholders' response has been excellent with subscriptions falling between 97%-98% of the shares offered.

More electric companies are increasing payments to common stockholders. Of some 134 electric companies reviewed, 12 raised their dividend during the third quarter, bringing the number of increases up to 42 (by 40 companies) during the first nine months this year. During the same period last year 28 companies boosted dividend payments, and of this number 13 were also included on this year's list.

Mountain States Rate Cut Called Discriminatory

Four customers of Mountain States Power Co have challenged a June, 1950, order of the Oregon Public Commissioner whereby the private utility was permitted to cut rates for service competing in Springfield with a municipal system.

The complaints were made by MSP customers living just outside Springfield, who claim the two rates discriminate against them because rates of MSP inside the town are 20 to 25% lower. They ask refund of the differences paid since former PUC Commissioner George Flagg issued the order which he said at the time was done on the legal opinion of Attorney General George Neuner.

Arguments were heard by PUC Commissioner Charles Heltzel in Salem when Attorney William S. Fort, Springfield, represented the four complainants, and Attorney Francis Hill appeared in behalf of MSP.

A similar rate structure exists at The Dalles where Pacific Power & Light Co competes directly in the city with a PUD. The different rates were recognized last winter when PUC authorized both MSP in the instance of Springfield and PP&L at The Dalles to omit surcharges levied elsewhere in their system because of high steam costs during the hydro shortage.

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POSITIONS VACANT

WANTED — SALES Manager for well known Manufacturer of Power and Distribution Transformers. Salary $15,000 to $20,000. P-9256, Electrical World.

WANTED: ELECTRICAL Engineer for Office and Field Work, Central Illinois Public Service Co., Springfield, Illinois. Att. Electrical Engineer.

SELLING OPPORTUNITY OFFERED

SALES ENGINEER, age 25-35, some technical background desirable, to call on utility industry from Chicago office of long established cable company. Permanent position, salary and expenses. State age, educ., experience, refs., sal. SW-9381, Electrical World.

EMPLOYMENT SERVICE

SALARIED PERSONNEL. $3,000-$25,000. This confidential service established 1920, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

EXPERIENCED SWITCHBOARD Operator would like operating job in central or substation. PW-8267, Electrical World.

ELECTRICAL ENGINEER,—age 29, 5 yrs. experience in plant Electrical Design, Construction & maintenance. Present position—Electrical Superintendent on $5,000,000 project. Desire similar position. Will relocate. Available Jan. '54. PW-9815, Electrical World.

ELECTRICAL ENGINEER, age 30 desires position with small or medium size Utility. 2 years experience as R.E.A. Resident Engineer, 3 years experience for Public Utility as designer of distribution and planning of maintenance work. PW-9864, Electrical World.

—WANTED—

Meters

Any Quantity

ATLANTIC
Electric Meter Corp.
214 E. 41 St., New York 17, N. Y.
Vanderbilt 6-1955

METERS WANTED
5 AMP. GE Type I 16
or Later
THE ELECTRICAL WATTHOUR METER CO.
76-15 Woodside Ave., Elmhurst 73, N. Y.

TRANSFORMER ENGINEER

Familiar with all phases of design and construction of dry type and oil filled transformers through 10,000 KVA. Give complete background and experience. Excellent future, growing concern. Location New Jersey-Greater N. Y. area.

P-9852, Electrical World
330 W. 42 St., New York 36, N. Y.

GUY WIRE

3/16" $10.74 per 1000'
¼" 14.85 per 1000'
½" 41.15 per 1000'
All the above is Siemens-Martin 7-strand Guy Wire.
Price is FOB St. Paul, Minn.
DONOVAN CONSTRUCTION COMPANY
St. Paul, Minnesota

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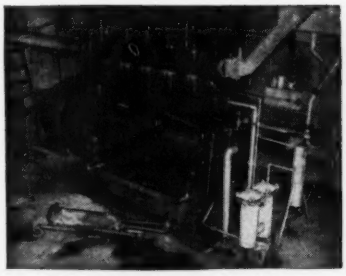
185 KW DIESEL GENERATING UNIT

480 V. 3 ph. 60 cycle



Intermediate Speed—Like New

Engine: Ingersoll Rand Type S, 273 BHP 720 rpm, air starting, 5 cyl, 1946 model

Accessories: Woodward Governor, oil & fuel filters, water pumps, fuel & water tanks heat exchangers, starting equip.

Generator: Elliott 231 KVA, 185 KW, 480 v. 3 ph, 60 cycle, .8 pf, with 5 Kw exitor.

Also includes panel board, piping, extra parts and tools.

Write for complete specifications & price

MACHINERY CENTER, INC.

Formerly: Roger Pierce Equipment Sales Co.

808 Newhouse Bldg. Salt Lake City, Utah

TRANSFORMERS

FOR SALE

6—1000KVA Mol	11500-2400/4160Y
3— 500KVA G-E	22000-2300/4000Y
3— 333KVA G-E	33000-2300/6900
3— 333KVA G-E	33000-2300/4000Y
3— 333KVA Mol	7200/12470Y-2400/4160Y
3— 333KVA W-H	6600-2300
3— 200KVA G-E	2400/4160Y-120/240
1— 200KVA Mol	2400/4160Y-240/480
3— 150KVA G-E	44000-600/2400
3— 150KVA G-E	19050/33000Y-2540/4400Y
3— 100KVA G-E	33000-6900/11950Y
3— 50KVA A-Ch	33000-2400/4160Y
1— 500KVA W-H	27600-444/131 3-ph.
1— 450KVA Penn	14520/13200-2400 3-ph.
1—150KVA G-E	7620/13200Y-120/208Y 3-ph

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.

Cincinnati 27, Ohio

40 Years' Dependable Service

TURBO GENERATOR

Available Immediately
7500 KW G.E. Co.
180 P.S.I.—525°F Total Temp.
3 phase 60 cycle 2300 volt
With Surface Condenser
GOOD CONDITION

Union Electric Co. of Missouri
315 N. 12th Blvd. St. Louis 1, Mo.

FROM AVAILABLE STOCK

TURBO GENERATORS IN STOCK

Qu.	KW	Make	Desc.
1—	1000	G.E.	Non-Cond—190 lbs-2400-3-60
1—	1000	Moore	Condensing—Extraction—190 lbs., 2400-3-60—Surface Cond.
1—	750	G.E.	Condensing—265 lbs., 440-3-60 Built 1944
1—	500	Moore	Non-Cond—150/200 lbs., 5/35 lbs. B.P., 480-3-60 Dir. Conn. Exciter.
1—	300	G.E.	Non-Cond—150/175 lbs., 5/10 lbs. B.P., 480-3-60
1—	200	Whse.	Non-Cond. 125/150# ISP 5/10# B.P., 240/480 v-3-60

FREQUENCY CHANGERS

Qu.	Kva	Make	Cycles	Voltages
1—	12500	Whse.	25/60	13200 x 13200
1—	3750	G.E.	25/60	4150/2400 x 2400/4150
1—	3125	G.E.	25/60	4150/2400 x 2400/4150
2—	2500	G.E.	25/62½	2300 x 4160
1—	1250	G.E.	25/58.3	4400 x 2300
1—	625	A.C.	25/60	11000 x 2300

MOTOR GENERATOR SETS

3 ph, 60 cy.

Qu.	KW	Make	Speed	DC Volts	AC Volts
1—	3000 3U	G.E.	514	600	4000/13200
2—	2000	G.E.	450	250	2400
2—	2000	G.E.	514	600	6600/13200
1—	2000	G.E.	500	666 25 cy.	11000
2—	1750	G.E.	514	250	2400
1—	1500	C.W.	514	115	4000/13800
1—	1500	G.E.	720	600	13200
1—	1000	G.E.	900	260	4100/6900
2—	1000	Whse.	900	600	2300/4150
1—	750	Whse.	900	275	2300/4150
1—	500	Whse.	1200	125/250	2300
1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
1—5000	Whse.	OISC	3	33000x26400/13200
1—3500	G.E.	WCT	3	13800 x 2300/440
1—2500	Whse.	OISC	3	26400/13200 x 480
3—2000	G.E.	HVDDJ	1	66000 x 13800
3—1250	G.E.	HVDDJ		6600/550
3—1000	G.E.	HVDDJ	1	2200/480

BELYEA COMPANY, INC.

OFFICE & SHOP

51 Howell St. Jersey City 6, N. J.

DIESEL POWER

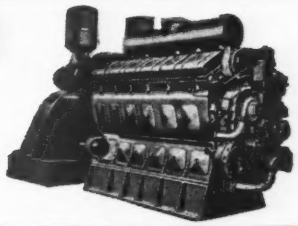
IMMEDIATE SHIPMENT

• PURCHASE OR RENTAL

UNIT CAPACITIES—10 TO 2475 KVA

A.C.—50 AND 60 CYCLES

• ALSO D.C. UNITS



A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM	KW	Make	Model	HP	RPM
1980	Nordberg	TS-217	2800	225	320	Enterprise	DSG-6	560	450
1136	Fairbanks Morse	38D	1600	720	300	General Motors	8-268A	450	1200
1100	General Motors	16-278A	1600	720	200	General Motors	8-268A	350	900
750	General Motors	12-567	1080	720	150	Worthington	CC-4	225	450
600	Baldwin	VO-8	750	514	150	Ingersoll-Rand	8-4	225	600
500	General Motors	8-278A	750	720	150	Buckeye	80	240	600
500	General Motors	8-567	720	720	100	Worthington	BB-5	150	600
480	Worthington	DD-8	700	360	100	General Motors	3-268A	150	1200
400	Ingersoll-Rand	8-8	600	720	60	General Motors	6-71	90	1200
350	Baldwin	VO-6	510	450	30	Internat'l Harvester	UD-14	45	1200

A. G. SCHOONMAKER COMPANY, INC.

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J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

1606 53rd ST., NORTH BERGEN, N. J. N.Y.C. Tel. LOngacre 5-3227 N. J. Tel. UNion 3-2500

TRANSFORMERS

1—1500 KVA G.E., 3 Ph., 4150V. 2300V. Pyranol
2— 750 KVA G.E., 3 Ph., 4150V. 120/240V. sec.
2— 750 KVA G.E., 1 Ph., 4600V. 115/230
2— 400 KVA Pitts., 1 Ph., 2400/4800V. 240/48V.
3— 333 KVA Whse., 1 Ph., 2400V. 600 V. sec.
2— 300 KVA G.E., 1 Ph., 13200V. 220/440V.
1— 200 KVA G.E., 3 Ph., 2400-220 sec.
3— 200 KVA G.E., 1 Ph., 13200V. 440V.

SYNCHRONOUS MOTORS

1— 300 H.P., Elec. Mach., 720 RPM. 3 Phase 60 cyc., 2200V T E F Cooled Outdoor service.
1— 150 H.P., G.E., 1800 RPM. 220V. 3/60.
2— 150 H.P., Al. Chal. 360 RPM. 440V. 3/60.

MOTOR GENERATOR SETS

1—1800 KW Whse., 600 V. 720 RPM, 4000 Syn.
1—1000 KW G.E., 600 V. 514 RPM, 4000 Syn.
1—1000 KW Whse., 275 V. 720 RPM, 4000 Syn.
1— 200 KW Whse., 250V., 900 RPM, 4000V. Syn.
1— 150 KW G.E., 125/250V. 1200 RPM, 2300 Syn.
1— 100 KW G.E., 250V. 900 RPM, 2300V. Syn.

SLIP RING MOTORS

2— 500 H.P., G.E., M 1200 RPM 2400 V.
1— 400 H.P., West., CW. 450 RPM, 550V.
1— 250 H.P., West., CW. 600 RPM, 440V.
1— 200 H.P., West., CW, 600 RPM, 440V.
3— 150 H.P., Al. Ch. 1800 RPM, 2300V., 3PH, 60 Cy.

Large Stock of A.C. and D.C. Equipment

"SEARCHLIGHT" Opportunity Advertising

—to help you get what you want.

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Take advantage of it—For Every Business Want

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Cole Electric Co.

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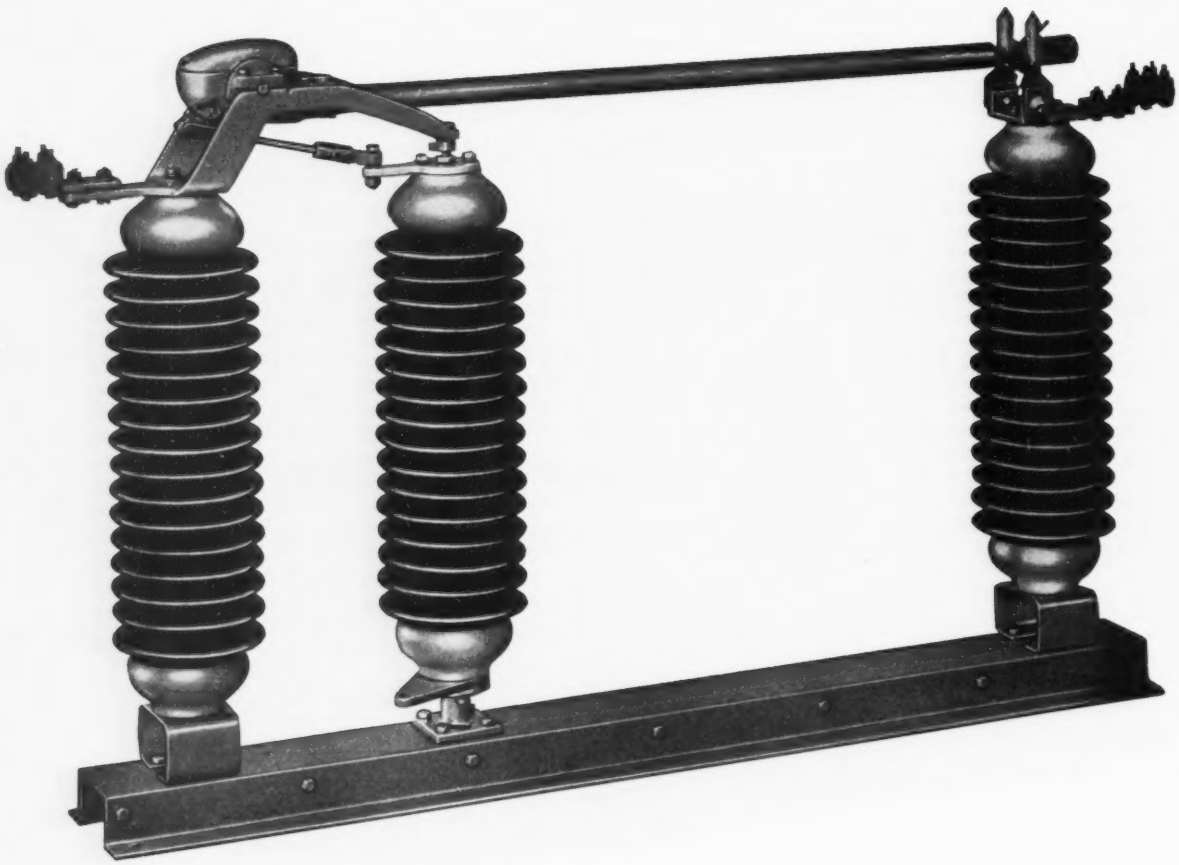


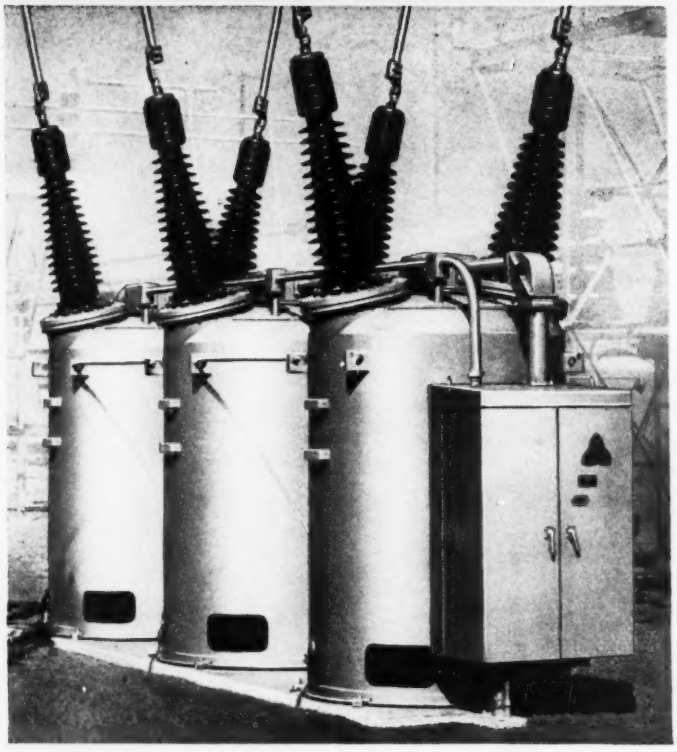
AIR BREAK DISCONNECTING SWITCH
69,000 Volts—600 Amperes
Type O-2
Vertical Break, Three Pole, Single Throw
Group Operated—One Pole Shown
HIGH PRESSURE SILVER TO SILVER CONTACTS
See Bulletin 46-A

Advanced Protection for Present and Future Loads

PACIFIC ELECTRIC
Type RHE
CIRCUIT BREAKERS
ASA, AIEE, and NEMA STANDARD

Projection of load growth and of maximum fault current may indicate the selection of breakers of far higher rating than present load requires.

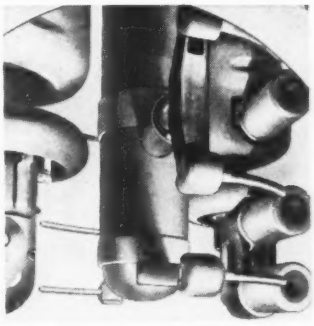
115, 138, 161 kv — 3 or 5 cycles
196/230, 230, and 287 kv — 3 cycles
to 10,000,000 interrupting kva (ASA)
at 161, 230, and 287 kv

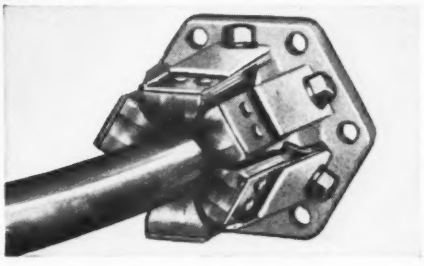


At Left:
One of Fifteen Type RHE-78, 161 kv, 10,000,000 int. kva for Electric Energy, Inc., Joppa, Illinois.

At Right:
Interior of Tank; a single rotary structure connects six interrupters in series (three are shown).

Below:
Moving Contact Entering Nest of Six Sliding-Shoe (finger) Contacts.





These features contribute to Pacific's Proved Protective Performance . . .

Nested Sliding-Shoe Contacts

PACIFIC'S Continued use of the reliable nested sliding-shoe (finger) form of contact, even for the largest circuit breakers, is now supported by the industry trend when severe conditions are to be met.

The stationary and moving contact surfaces of the contacts are silver Elkonite, of such form that arc foot prints are confined to portions of the surfaces that do not carry load current.

The stationary contact structure of each pole comprises six sets of contacts in series, each of either four or six shoes, depending on rating. Voltage division between the sets of contacts is aided by capacitance grading shields.

Proved Interrupters

Pacific interrupters are of simple self-pressurizing type; their exceptional performance is due to improved utilization of directed oil flow and to high speed of developing open-gap distance.

Other Features

- Only one moving structure within the tank.
- Opening accelerating springs and shock absorbers are outside of the tank.
- Oil-hydraulic restoration of closing energy.
- Easy manual emergency operation for load switching as well as for test.
- Electrically and mechanically trip free in any position, even during high-speed reclosing.

Since 1906

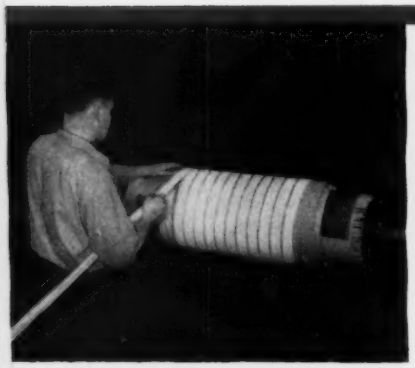
SALES OFFICES or AGENCIES
in PRINCIPAL CITIES

PACIFIC ELECTRIC • MFG. CORPORATION •

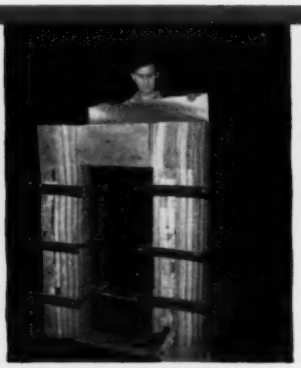
SUBSIDIARY OF FEDERAL ELECTRIC PRODUCTS COMPANY

5815 THIRD STREET, SAN FRANCISCO 24, CALIFORNIA
OTHER FACTORIES: SANTA CLARA, CALIF.; SCRANTON, PENNA.

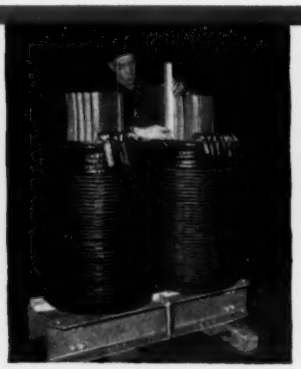
This is how *Kuhlman* craftsmanship assures you dependable transformers



1. The coils of Kuhlman power transformers are usually wound concentrically. Coils that are to carry heavy currents at low voltage are of the interleaved disc type. Above, a cylindrical LV core for a 1000 KVA transformer being wound with multiple wires transposed when necessary to maintain low stray losses.



2. Assembling the core for a 1000 KVA transformer. After the assembler has finished inserting the laminations, the core will be inverted to receive the coils. The laminations are made of cold-rolled oriented silicon steel which permits the flux path to follow the grain of the steel producing high permeability and low hysteresis.

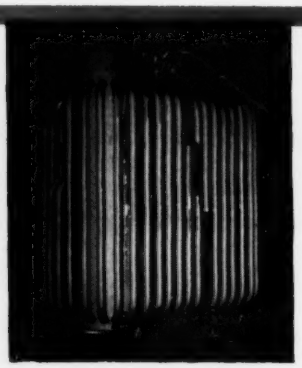


3. Here the core has been inverted and assembled to the lower part of the core clamp. The coils, which have been immersed in a thermo-setting varnish and baked, have been slipped over the legs of the core. The assembler is bracing the core to prevent shifting and vibration.

4. After the core has been braced, the assembler inserts the necessary laminations on top to complete the core. After this, the remainder of the core clamp will be assembled and the core and coil assembly will be ready to be lowered into the tank.

5. The tank is made of heavy steel plate, electrically welded at the seams. Here you see the cooling tubes being welded on the outside of a tank to provide oil-tight and rust-proof joints.

6. In this picture, the welded joints of the cooling tubes are being tested for leaks. After these tubes are put on the tank, the entire tank is filled with kerosene and subjected to air pressure as a final check to determine if the tank is completely oil-tight.



7. Finally, the entire tank is shot-blasted and painted with a coat of rust-inhibitive primer and two coats of corrosion resistant paint. The tanks are then ready to receive the core and coil assembly.

8. Kuhlman transformers are engineered for long life and dependability. They are built from carefully selected materials according to sound principles of design and assembled with infinite care and patience by skilled craftsmen with years of experience at their job. Then each transformer is thoroughly inspected and tested for safe, efficient performance. When you install your next transformer, specify Kuhlman for transformers of outstanding quality — backed by nearly 60 years of electrical manufacturing experience. Write us today for the name of your nearest Kuhlman representative.

Kuhlman ELECTRIC COMPANY, BAY CITY, MICHIGAN
CRYSTAL SPRINGS, MISSISSIPPI

KUHLMAN K E ELECTRIC

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